THE COMPARISON OF ATTACKING EFFICIENCY INDEX (AEI) DERIVED FROM YOUNGER MALE AND FEMALE SENIORS (U-23) PARTICIPATED AT THE NATIONAL JUDO CHAMPIONSHIP OF BOSNIA AND HERZEGOVINA

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Abstract: The main objective of this research is about to compare the attacking efficiency index (AEI) derived from younger male and female U-23 seniors, participated at The National Judo Championship of Bosnia and Herzegovina held in 2015 at Ilidza-Sarajevo. The sample of respondents consists (n=60) combats of younger male seniors and (n = 22) combats of younger female ones in all seven weight categories. The sample of variables consists of throwing techniques, parterre techniques and scored technical points as result of the quality of the throwing techniques and the techniques in the parterre being performed. The data were collected by video analysis of the combats from younger male and female seniors that participated at The National Judo Championship of Bosnia and Herzegovina. The results shown that there were not any differences in the points scored between the younger male and female seniors of U23. The results of the T-test for independent samples shown the existence of statistically significant differences in the cumulative attacking efficiency index, which was AEI = 10.9 at younger male seniors and AEI = 11.77 at younger female ones. The AEI results of the individual techniques shown that the most effective ones were at the younger male seniors named Kesa gatame, Tani otoshi and Uchi mata, and at the younger female seniors named O Soto Gari, Ouchi gari and Kesa gatame. The results suggested the need to re-analyze the performances from competitions of younger male and female seniors, as well as the recommendation for coaches to adjust their plans and programs of technical-tactical and fitness preparation of athletes, especially younger female seniors.

Key words: Combat sport, gender, performance, analysis

INTRODUCTION

The diversity of approaches in the analysis of the performances of male and female competitors in judo at younger age categories in both genders is essential for further progress in achieving the suc-cess of judo competitors based on relevant infor-mation, and above all from the competitions.

Judo was commonly described as a martial art, a spiritual discipline, a system of physical education and recreational activity. Judo literally means "the way of gentleness", precisely a dynamic combat sport that demands both physical prowess and great mental discipline (Peset et al., 2013).

The competitive Judo is a highly explosive, dynamic, intense physical and mental activity with highly developed aerobic and anaerobic energy systems (Callister et al., 1991; Pulkkinen, 2001).

The role of aerobic processes in Judo is to prepare the working capacity of heart and the ability of one to deliver oxygen to the muscles, that will improve oxygen delivery through continuous training.

On the other hand, interval training will more ef-fectively influence at increase of oxygen utilization during the combat (Sterkowicz et al., 1999).

The application in Judo's practice entails a major recovery from aerobic work (via lactate metabo-lism), faster phosphate resynthesis and where is needed to increase individual maximal oxygen uptake VO2max (Astrand and Rodahl, 1986; NCCP, 1990; Taylor et al., 1981; Thomas et al., 1989; Little, 1991; Mickiewicz et al., 1987; Callister et al., 1991; Horswill et al., 1992; Matsumoto et al., 1978; Kaneko et al., 1978).

The role of anaerobic processes in Judo is reflect-ed trought the efficiency of muscle work, which is determined by lactate anaerobic or aerobic glycolytic abilities. This energy system contains both systems; ATP - CP (Alactic) and Lactate (Anaerobic glycolytic) systems (Verhošanski et al., 1992; Pulk-kinen, 2001. As mentioned earlier, Judo primarily contains an anaerobic system, and therefore exercise is applied that is characteristic in the adaptation of these systems.

Lactate and non-lactate energy systems will be focused on two details as follows: the general, one that is useful in sport's science for assessing the effectiveness of training programs and specific one, as a presentation of profiles of what individu-al world champions may exhibit in their performance. Judo's scientist and trainers need to understand which of these components are essential for the success in Judo and how to harmonize the training regime, thus ensuring that Judo's training is even more effective (Capriano, 1993; Astrand and Rodahl, 1986; Cipriano, 1993; Astrand and Rodahl, 1986; Astrand and Rodahl, 1996).

Related to the structure of movement, Judo be-longs to the poly structural acyclic sports that take place in variable conditions. The combat between two rivals takes place in "tachi waza" - a combat in a standing position and "ne waza" - a combat in a parterre position, and both ways of combating require different

approaches in training and com-petition (Seisenbacher and Kerr, 1997; Murayama et al., 2005).

In Judo, men and women do not combat with each other, but this does not prevent Judo re-searchers from exploring the similarities as well as differences between the different genders. Thus, the research conducted by Callister et al., (1991) stated the existence of differences in morphological and physiological characteristics between men and women at the world level of Judo's competion.

The anaerobic role in Judo is determined by a research of Callister et al., (1991) on the sample of vastus lateralis muscles at male and female competitors of U.S.A. National Team. They found that female competitors had a higher value of type I muscle fiber content (48.9%) compared to male competitors (35.7%). Female competitors had type II B muscle fibers, average value (10.5%), and male competitors (26.8%). Type II A muscle fibers had the same ratio between male (37.1%) and female competitors (38.5%).

The research of technical-tactical characteristics of Judo's combats were objective of many researchers, so Calmet, Trezel and Ahmaidi (2006) by analysis of Judo's combact concluded that to succeed you need to improve several throwing techniques in three or four different directions of attack and to have a firm grip that will allow them to be performed. Due to the great complexity of throwing techniques in terms of better and faster progress, they recommended learning throwing techniques in a coordinated throwing system.

Heinisch and Oswald (2007) were trying to analyze the dominant tactical-technical combating styles that get the best results in today's Judo. In Judo, the main aspects of high performance used during training can only be derived from the behavior of top judokas during combat. Therefore, competition analysis, as a complex method of performance analysis aimed at collecting, processing, analyzing and interpreting information become more and more the dominant diagnostic method.

Basically, the winning performance is almost al-ways higher activity in Judo's combats of your opponent as well as high technical-tactical perfection (higher efficiency in attack and defense). Despite the growing specialization in top sports, athletes who attack their opponents with greater technical diversity still predominate.

Sterkowicz, Lech, and Almansba (2007) were analyzing the different ways of combat shown by medalists at the Polish championship in relation to lower ranking competitors. They analyzed 518 Judo's combats that took place during Judo's championships in Poland in 1999 and 1998. The main indicator of the differences was the activity index in Judo's combats (number of actions divided by the number of combats). That index was almost twice as high among the competitors who won a medal at the analyzed competitions.

The authors consider that this result has related to better physical preparation of higher-ranking judokas. It has also shown that in lower judokas the activity index does not change significantly during the combat, while in higher judokas the activity index has a variable character. During the combat, the index decreases in the second and fourth minutes, and increases in the fifth minute. Such results were associated with greater tactical prepa-ration of higher-ranking judokas. These results have served the authors to create a tactical scheme of Judo's combat characterized by a grad-ual progression of activity from the first to the third minute, a decline in the fourth, and an increase again in the fifth minute.

Franchini and Sterkowicz (2000) were analyzing the techniques used during the Olympic Games and at the World Championships between 1995 and 1999. They also determined the time in combat during which these techniques were used, taking into account the weight (lighter and heavier). The main findings of the statistical analysis of 4,813 actions were: (1) the dominance of foot techniques in both lighter and heavier categories; (2) the highest points by throwing were obtained in the first three minutes of the combat; (3) penalties earned al-most half of the points scored in judo; (4) there was a trend in scoring points, that was more stressed in higher weight categories. The percent-age of Ippon, Wazari and Yuko decreased, while the number of penalties increased during the 1995-1999 tournament; (5) In 1997, new tech-niques emerged that did not exist in previous clas-sifications. This knowledge can be useful in the organization and management of major sporting events, as well as for coaches who can better prepare their competitors based on them.

Boguszewski and Boguszewska (2006) were ana-lyzing the dynamics of Judo's combat shown by the finalists of the 2005 European Championships in Rotterdam at men and women. They assumed that the finalists of the European Championship were top athletes with extraordinary abilities. The analysis included 14 final Judo's combats, and the following parameters were determined: offensive/defensive activity, efficiency in attack, efficiency in counterattack, efficiency of defense without counterattack and general dynamics of the combat. The resultsindicated that the winners in Judo's combat had higher indexes of efficiency parame-ters: efficiency in attack, efficiency in counterattack, and general dynamics of the combat.

There was no significant difference between male and female judokas and weight categories. The authors concluded that the rules of Judo's combat should increase the dynamics of combat. In addition, tactical

training should be based on achieving a result advantage as well as on effective defense and exploiting the opponent's mistakes.

Inakamura et al., (2006) were doing analysis of the World Judo Championships from 1995 to 2005 to stress out how the performance of the competi-tion changed during that period. The research was prompted by the activities and rules of the IJF (World Judo Federation) that made Judo a more dynamic and aggressive sport in recent years. New rules such as the emphasis on punishing passive combat in the late 1990s and the introduction of the golden point in 2003 has required from judo-kas to be more physically prepared and to have continuous attacks.

Also, in 2003 at the women's competition for fe-male seniors, the combat was extended by one minute, thus raising the demands in women's Judo. The research included results from 4,500 Judo's combats from six world championships. The percentage of ippons in the competition increased from 51.4% in 1995 to 59.6% in 2003, but also decreased to 57.1% in 2005. The highest percent-age of ippons was recorded in 2001 when it was 65.0%. Winnings on the koka or gold point de-creased from 5.7% in 2001 to 2.9% in 2003 and 2.1% in 2005. The percentage of ippon at women increased significantly from 50.2% in 2001 to 58.1% in 2003. The results indicated that Judo has become a more dynamic sport if one looks at the ratio between wins on ippons and wins on the koka. In 2003 it can also be noted that according to these indicators, the significant difference be-tween male and female's Judo disappeared.

Sertić, Szeged and Sterkowicz (2008) were identif-ing differences between the use of throwing tech-niques by juniors by analyzing the combats at the 2005 European Junior Championships. By analyzing 409 Judo's combats, they noticed the grouping of weight categories into two groups depending on the techniques used in them. The -48 kg and -52 kg categories had an equal distribution of throwing technique groups. They dominated by manual throwing techniques, followed by pedal foot, sacri-ficial and side throws.

This group can be joined by the category -57 kg, that is not completely identical to the first two categories, but it is also dominated by manual techniques. The second group included categories from -63 kg to +78 kg in which pedal foot and sacrificial techniques have dominated. In the jun-ior categories -60 kg, -66 kg, -73 kg were domi-nant the use of manual techniques and within them the most dominant the throwing of Kata Gurum. At the second place were foot techniques. The second group of categories from -81 kg to +100 kg connected only by the dominant use of foot techniques. The technical efficiency of female judokas and male judokas from the European Championship was compared with the technical efficiency of female judokas and male judokas of lower rank at the Zagreb Open 2005 tournament. The authors concluded that judokas of lower rank had not as large a range of techniques as those of European ones.They also noticed that the number of techniques in Judo's combat were smaller, and they were being performed in a more sparse choice of combinations with too many direct and unconnected attacks.

Sertić, Szeged and Vučak (2009) were analizyng the European Judo Championship for younger male seniors and in a sample of 174 combats at men's competition they indicated that the use of different groups of throws distributed very similarly in all weight categories, that is, there was no significant difference between light, medium and heavy-weight. During the analyzed Judo's combats, a total of 24 different throwing techniques were successfully performed. In 174 combats, a total of 214 throwing techniques (1.22 per combat) were successfully performed, of which 75 throwing techniques (35%) qualified as ippon.

If we associate to this number the techniques by which the ippon scored in the non-waza position (21 techniques), it was concluded that 52% of the combats ended before the end of regular time with an attractive technique in the tachi waza or non-waza position. The most commonly used throwing techniques, in the men's part of the championship, were: 1. Manual throwing techniques with a total of 102 successfully applied techniques during the championship. Within this group of throws, the most used techniques are: Kata Guruma (26), Te Guruma (19) and Seoinage (17). 2. Sacrificial throwing techniques with a total of 58 successfully applied techniques during the championship. With-in this group of throws the most used techniques were: Tani Otoshi (21), Soto Makikomi (14), Sumi Gaeshi (9). 3. Foot throwing techniques with a total of 43 successfully applied techniques during the championship. Within this throwing group the most used techniques were: Uchi Mata (16), Ouchi Gari and Kouchi Gari (8). 4. Side throwing tech-niques with a total of 11 successfully applied tech-niques during the championship. Within this throw-ing group the most used techniques were: Harai Goshi and Sode Tsurikomi Goshi (4) and Koshi Guruma (3).

Calmet et al., (2010) were comparing the total length of the match, the frequency of points (ip-pon, wazari, yuko) and penalties (shido) between the Rio 2016 and London 2012 Olympics (before and after the rule change), taking into account the weight categories and stages of the competition. Data from 307 female and 470 male athletes ana-lyzed, each of them had 1.022 and 698 matches in both competitions. The results (Rio 2016 vs. Lon-don 2012) suggested that there was no change in the results of ippon and wazari, by reducing the number of yukos and increasing the number of penalties. Women scored more yukos and had fewer

penalties than men. The women's matches in Rio were shorter than the matches for all other groups. There was no difference in the results and penalties for the different weight categories, but in the light heavyweight category the matches were shorter than those in the lightweight category.

Miller et al., (2015) were evaluating the use of throwing techniques based on The British Champi-onships dated 2013. The data shown that British judokas used foot techniques (ashi-waza) most effectively, and Uchi-mata proved to be the most effective technique. Men and women, juniors and seniors, used different techniques, however only young male competitors provided data that had not matched the overall trend, with manual tech-niques (te-waza) where Seoi-nage was the most effective throwing technique.

Kajmović and Rađo (2014) were investigating the comparison in the efficiency index of throwing techniques between male and female seniors from the same and opposite guards. Based on the nota-tion's analysis of 280 guard configurations and the same number of male seniors throwing techniques and 166 guard configurations and the same num-ber of female seniors throwing techniques from The National Championship of Bosnia and Herze-govina dated 2013 and 2014. The existence of differences between frequencies from the same and opposite guard were determined. Male seniors dominate throws from the same (Ai yotsu), while female seniors dominate throws from the opposite guard (Kenka yotsu).

The most effective throwing techniques from the same guard for male seniors were Ippon seoi nage (0.68) and for female seniors Harai goshi (0.73). The technique that had the highest effi-ciency index in male seniors from the opposite guard was Uchi mata (0.66), and in female seniors Uchi mata (1.21). The information from this research can be useful to coaches and competitors, so they can treat the guard to a new approach, but also to researchers of Judo to develop new ways to research the guard at different levels of compe-tition and apply these research results in training practice. Based on all the above, the goal of this research is to compare the attacking efficiency index of younger U-23 male and female seniors from the National Judo Championship of Bosnia and Herzegovina.

METHODS

Sample of respondents

The sample of respondents consists of (n=60) combats of younger male seniors and (n=22) combats of younger female seniors in all seven weight categories.

Sample of variables

The sample of variables consists of throwing tech-niques, parterre techniques, scored technical points (Ippon, Waza-ari and Yuko) as a result of successfully performed throwing techniques and techniques in the parterre.

Method of data collection

Two analysts were collecting data by using notarial analysis of video recordings of the fights of U23 yonger male and female seniors from The National Judo Championship of Bosnia and Herzegovina held in 2015 in Ilidza - Sarajevo. Analysts were longtime competitors, coaches and judges in Judo with respectable sports results. Each arena was filmed with a Sony video camera and analysts could see the fighters, the judges and their gestures and the scoreboard next to the arena. The data were entered into specially prepared proto-cols of Judo fighting.

Ethical approval

The research was approved by the Scientific Coun-cil of the Faculty of sport and Physical Education University of Sarajevo (02-1967/20).

Reliability

The results of Cohen's kappa test for estimating the agreement of two judges for female and male competitors is .880, which represents a very good agreement between two judges in the process of awarding techniques and points during the competition U-23.

Data processing methods

All results were calculated in frequencies and per-centages. The Chi-square test was used to deter-mine the differences between younger male sen-iors and younger female seniors in the scored technical points. The index of situational efficiency of Judo techniques by younger male and female seniors was calculated based on the formula (Ad-am, Klimowicz, Pujszo, 2016)

$$AEI = (5p \cdot YN + 7p \cdot WN + 10p \cdot IN)/CN \quad (1)$$

Where is (YN the number of yuko, WN the number of waza-ari, IN the number of ippon, CN contest number). A t-test for independent samples was used to determine differences in the situational efficiency index between younger male and female seniors. The statistical significance level was set at $p < 0.05$ for all analyzes. Statistical Package for Social Science (SPSS) base 22.0 for Windows (IBM, USA) was used to compute the statistics.

RESULTS

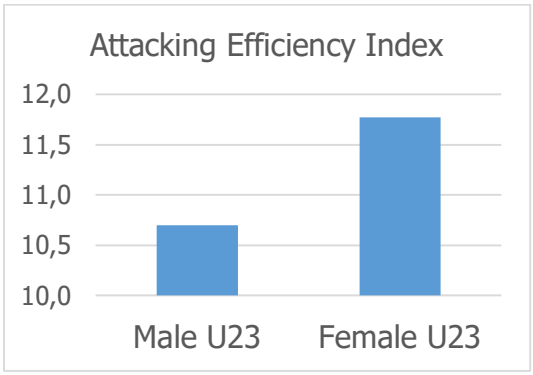
The results of the Chi-square test (Table 1) at the level of statistical significance of 0.05% show that there is no statistical significance (Chi-square test = .712; df = 2; Phi = .080; p = .701) in the com-parison of the scored points (Ippon, Waza-ari and Yuko) as a result of the quality of the throwing technique performed and the technique in the ground floor between the younger male and fe-male seniors.

Table 1. Comparison of scored technical points between younger male and female U-23 seniors.

			U23		Total
			Female	Male	
POINTS	Ippon	Count	16	34	50
		% Points	32.0%	68.0%	100.0%
		% U23	50.0%	42.5%	44.6%
		% of Total	14.3%	30.4%	44.6%
		Std. Residual	.5	-.3	
	Wazari	Count	8	20	28
		% Points	28.6%	71.4%	100.0%
		% U23	25.0%	25.0%	25.0%
		% of Total	7.1%	17.9%	25.0%
		Std. Residual	.0	.0	
	Yuko	Count	8	26	34
		% Points	23.5%	76.5%	100.0%
		% U23	25.0%	32.5%	30.4%
		% of Total	7.1%	23.2%	30.4%
		Std. Residual	-.6	.3	
Total		Count	32	80	112
		% Points	28.6%	71.4%	100.0%
		% Group	100.0%	100.0 %	100.0%
		% of Total	28.6%	71.4%	100.0%

Figure 1 shows that younger female seniors have statistically significant (t(36)= -3.161; p = .003) values of total AEI relative to total AEI values scored by younger male seniors.

Graph 1. Comparison of the overall Attacking Efficiency Index (AEI) between younger male and female seniors U-23.



The data from Table 2 shown the individual index-es of situational efficiency of the realized Judo's techniques from The National Championship of Bosnia and Herzegovina between younger male and female seniors held in 2015. In younger male seniors, the most successful parterre technique was Kesa Gatama, followed by Tani Otoshi throw-ing techniques and Uchi Mata foot technique. However, for younger female seniors, the situation was completely different and the most successful throwing technique was the foot techniques O Soto Gari and O Uchi Gari and the parterre technique Kesa Gatame. It is interesting that younger male seniors used a larger number of throwing tech-niques and parterre techniques compared to younger female seniors.

Table 2. Comparison of the index of situational efficiency of individual Judo's techniques between younger U-23 male and female seniors.

MALE SENIORS U-23		FEMALE SENIORS U-23	
Judo techniques	AEI	Judo techniques	AEI
Kesa gatame	1.72	O Soto Gari	2.68
Tani Otoshi	1.63	O Uchi Gari	2.36
Uchi Mata	1.28	Kesa gatame	1.82
O Soto Gari	0.77	Harai Goshi	1.00
Ippon Seoi Nage	0.75	Koshi Jime	0.91
O Uchi Gari	0.57	Ippon Seoi Nage	0.86
De Ashi Barai	0.45	Uchi Mata	0.68
Ura Nage	0.42	Tani Otoshi	0.55
Kami Shiho Gatame	0.33	Yoko Shiho Gatame	0.45
Ko Uchi Gari	0.28	Seoi Otoshi	0.23
Yoko Shiho Gatame	0.28	Koshi Guruma	0.23
Sumi Gaeshi	0.25		
Koshi Guruma	0.25		
Tate Shiho Gatame	0.17		
Koshi Jime	0.17		
Juji Gatame	0.17		
Hadaka Jime	0.17		
Tai Otoshi	0.17		
Yoko Tomoe	0.17		
Tomoe Nage	0.17		
Uki Goshi	0.17		
Harai Goshi	0.12		
Sumi Otoshi	0.12		
Ko Uchi Makikomi	0.08		
Soto Makikomi	0.08		
Seoi Nage	0.08		
Kata Guruma	0.08		

DISCUSSION

The objective of this work is about to compare the index of situational efficiency of younger U-23 male and female seniors from the National Judo Championship of Bosnia and Herzegovina. It was noticed that younger male seniors had a larger technical repertoire (27 throwing techniques and parterre technique) compared to younger female seniors (11 throwing techniques and parterre tech-nique). A higher index of efficiency of certain tech-niques in younger female seniors compared to younger male seniors does not mean that they were of better quality. On the contrary, it may indicate that for the younger female seniors were much easier to score throwing and winning tech-niques compared to the younger male seniors, who had to put in much more effort to overcome their opponent and come to victory. It is important that the number of female competitors

was lower than male competitors, which may also be one of the factors of a higher efficiency index compared to men. It is necessary to mention the fitness aspects of the respondents, which are certainly in favor of men compared to women.

The analysis of differences between men and women were the objective of research by many authors from different segments of Judo. A survey (Sterkowicz, 1999) of actions during Judo's com-bats from the 1996 Olympic Games provided key information on Judo, on gender differences from the highest level of competition. Women have used control interventions more, while men have used risky throwing more. The throwing techniques that men have used the most were: Seoi nage, Uchi mata, O uchi gari, Ko uchi gari, Ko soto gake, Kata guruma, O soto gari, while women have used the throwing techniques the most: Seoi nage, O uchi gari, Uchi mata, Harai goshi, Ko soto gake, Ko uchi gari.

Courel et al., (2014) were exploring the side of the guard and the throwing side on the success of attacks in elite judokas of both genders, in the final and semifinal combats at 12 IJF tournaments in all seven weight categories, found that the opposite guard (Kenka yotsu) guard was used mostly in both genders and all weight categories. However, from the aspect of efficiency, the technique of throwing from the same guard (Ai yotsu) was the most efficient guard. Also, the configuration of the guards of the same side from which the attack was placed increases the chance of winning the combat, especially in men, the closer they were getting to the end of the combat. Our oppinion is that the reason for this constellation is the better physical readiness of men and that they tried to use their fitness capacities at the end of a match in the function of victory.

Ito et al., (2014) were analyzing the guard and efficiency of techniques after the change of rules in 2013, that resulted in higher efficiency compared to 2012. The efficiency index of certain throwing techniques was for: Ippon seoi nage 0.20, Seoi nage 0.21, Uchi mata 0.51, Ko uchi gari 0.03, O soto gari 0.15, De ashi barai 0.02, O uchi gari 0.21, Koshi guruma 0.03, Sumi gaeshi 0.21, Tani otoshi 0.09, Ura nage 0.04, Soto maki komi 0.09. Comparing the efficiency index of throwing techniques from The National Judo Championship of Bosnia and Herzegovina for younger male and female seniors with the efficiency index scored at the World Championship in 2013, it was noticed that the efficiency index was significantly higher compared to the World Championship. These indicators are logical because the difference in quality and quantity is large, the selected sample of com-petitors and therefore it is much more difficult to place throwing techniques at the World Cup, and the efficiency index was lower compared to the BiH National Championship.

Sertić and Segedi (2012) were analyzing the structure of significance of individual throwing techniques at juniors and seniors conducted by different experts in Judo from five different countries, and who juniors and seniors rated from 1 to 5. Juniors considered the most important techniques for them were: Ippon seoi nage, Seoi nage, O uchi gari, Uchi mata, Ko uchi gari, Harai goshi, O soto gari, while seniors consider that the most im-portant techniques for them were: Ippon seoi nage, Seoi nage, Uchi mata, Ko uchi gari, Tai otoshi , O uchi gari, O soto gari, etc. It is obvious that both of these groups have a similar view on the techniques they applied in competitions as their special throwing techniques.

Tirp et al., (2014) were investigating the influence of throwing side preferences, in which the left side was dominanted over the right side of the throwing from different levels of competition, found a relative influence of the left in relation to the right combating position between and within the competition. It is interesting to note that the competi-tors who were dominant in the left combating position in all three competitions took from 1 to 5 places, and most of the competitors from the left position were from the Olympic Games, and then at the German University Championship. We are of the opinion that competitors who are at the top level or strive to become so must have the ability to perform throwings to the left and right side more evenly in real conditions in competitions, and that competitors who are one-sided, ie. they perform throwing techniques only in one direction, handicapped in relation to competitors who are not.

This statement was confirmed by a study (Adam, Smaruj, and Laskowski, 2014) in which the technical-tactical profile of the vice Olympic champion was analyzed, and it was found that he performed throwing techniques to the left (50.55%) and right (49.45%). %) throwing side. The throwing techniques with which he won world titles were: Seoi nage, Uchi mata, O soto gari, Ko uchi gari, Morote gari, Tani otoshi. All these techniques are also used by seniors, however, for their successful application at higher levels of competition, it is necessary to develop other segments that can be of great help in the implementation of these tech-niques. The results of the analysis of the Italian national team championship for cadets in 2009 (Dalponte, Pierantozzi and Lubisco, 2011), in order to determine the differences between men and women, came to the data that most throwing techniques were performed on the right side, which indicated that the right guard had a dominant role at this level of competition. The most dominant throwing techniques in both groups were techniques from the group of sacrificed (Sutemi) throws, while foot (Ashi) are second in efficiency (M = 22.5%; F = 16.1%).

Kajmović, Rađo and Kapo (2005) when they were analyzing the differences at the regional, Balkan championship found out the differences between men and women in the parameters of situational efficiency and found that men dominated in techniques: Kata guruma, Uchi mata, Sukui nage, Ippon seoi nage, O soto gari , while in women the most effective throwing techniques were: Uchi mata, Seoi nage, Harai goshi, O uchi gari, Ippon seoi nage.

Witkowski, Maslinski and Kotwica (2012) by analyzing throwing techniques from the 2008 Beijing Olympics, found that the most effective throwing techniques for men are: Seoi nage, Kata guruma, Kutchiki taoshi, Uchi mata, Sumi gaeshi, Morote gari, Ko soto gake, O uchi gari. It is clear that despite the change in the rules, some throwing techniques have remained in use by competitors and it can be a guide to further improve the tech-niques in their application, but also to enable competitors to effectively cope with these technique to defend. It was noticed that very little research in the field of guards and throwing techniques was conducted on women, and that is why we are of the opinion that special attention should be paid to this segment. Another important fact is that at the beginning of 2014 there was a new change in the rules by The International Judo Federation (IJF, 2014) and that the biggest changes occurred in the guard segment, which opens new spaces for research in this segment for both genders of different ages. and at all levels of competition. The results of research from different levels of competition in the segment of the most efficient throwing techniques and from The National Championship of Bosnia and Herzegovina show similarities, ie. using almost the same throwing techniques.

CONCLUSION

In order to determine the efficiency index of cer-tain throwing techniques that male and female seniors of U23 applied at The National Judo championship, different behaviors were observed between these two groups of respondents. What attracts special attention is that in younger male seniors the most successful technique was Kesa Gatame, and in younger female seniors the foot technique was O Soro Gari. What is important to emphasize is that this research was conducted at the competition from 2015, and that the rules of Judo have changed several times. Therefore, this kind of research in Judo can be done again with the same sample of respondents, but under the new rules of conducting combact with the scored points and the index of situational efficiency.

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