Technical-tactical preparation of Austrian judoka at the Austrian national championships and the number of associated injuries

Michael Handler¹, Markus Moser³, José L. Toca-Herrera² & Martin Burtscher¹

¹ Institute for Sport Science – Medical Section, University of Innsbruck, Innsbruck - Austria

² Institute for Biophysics - Department of Nanobiotechnology, University of Natural Resources and Life Sciences, Vienna – Austria

³ Austrian Judo Association – Österreichischer Judo Verband (ÖJV), Vienna - Austria

Corresponding Author:

Dr.med.univ. Michael Handler

Wimpassingerstraße 20

2630 Ternitz, Austria, Europe

michael.handler@me.com

0043 676 90 27 800

ABSTRACT

Background & study aim

The first Austrian Judo championships took place in 1947. Since then there hasn't been any scientific literature about technical, tactical or physical preparation about the participants. In addition, there hasn't been any trauma statistics of Austrian tournaments either. Some scientific studies describe Judo associated injuries on Olympic or international level, but how gentle is the "gentle way"? Are there any associations between techniques and injuries?

Material & methods

In order to perform this research audiovisual records of the "care system" of all medal fights during the Austrian Judo championships of 2014 and 2015 were analyzed. For 2014 the judo associated injuries were classified by video analysis by a medical doctor. For 2015 they were documented by medical doctors who treated the injuries during the competition time (mat doctors). SPSS was used for statistics. The significance level for the difference of the number of medical intervention dependent on the sex of the fighter was determined at $p < 0,1$ by Chi-square test.

Results

The number of fight interruptions because due to injuries for men and women was analyzed. They were 15 out of 84 for men and 4 out of 54 for women. The Chi-square value ($p < 0.1$) showed significant difference. The percentage of injuries were 18% for men and 7% for women, respectively. Bronze medal fights needed more medical interventions than gold ones.

Conclusion

It seems that gender determines the fighting style and also the risk of an injury. The high rate of hand and finger injuries shows the importance of the grip fight.

INTRODUCTION

Around 1900 Judo arrived in Austria. The first Austrian national championships were held in 1947 in Vienna, the capital of Austria – but only for men. The first Austrian national championships for women were held in 1973 in Wels, Upper Austria. (Schön, 2015) Today the Austrian Judo Association (Österreichischer Judo Verband, ÖJV) has about 25000 members. (Schön, 2013) Today Judo is a very popular Olympic sport and is widely known as the “gentle way”. There are some scientific studies about Judo associated injuries on Olympic or international level fighters. (Pocecco, 2013) But how gentle is the “gentle way” on national level? Is there any relation between the fighting techniques and the injuries? Since the beginning of the Austrian Judo Championships, there has not been any systematic scientific literature concerning technical, tactical or physical preparation and health aspects of the participants. Neither has there been any trauma statistics of tournaments in Austria. In March 2016 we conducted a database search with the keywords “judo”, “injury” and “Austria” in “Web Of Science” and “Pubmed”. “Web Of Science” brought no results and “Pubmed” showed five results but no one of the results compared the technical approach of the competition participants with the occurred injuries. No study of the results was done with Austrian judoka. A useful tool to do all these research processes was the match analysis with audiovisual records of the competition fights. (Krosshaug *et al.*, 2005) This technological development is a valuable source of many levels of information like physiological, technical, strategically, adversary linked and injury data. (Sacripanti, 2010b) The required use of the “care system” (a video system to record the fight and support the referee on the mat) by the International Judo Federation (IJF) and the video broadcast of international Judo events by the IJF on ippon.tv via Internet are huge sources of video

material of Judo competitions under IJF rules for match analyzing for national coaches and the IJF itself. (Ijf, 2014) But on national level in Austria there is no video broadcast by the Austrian Judo Federation and the “care system” videos are not released for public use. So the coaches of national level Judoka have to record the fights of their own sportsmen and their adversaries on their own to do match analysis. For scientific research it’s necessary to reach an agreement with the national Judo Federation to get the records of the “care system”.

For this purpose we have analyzed the videotapes of the “care system” of the Austrian Judo Championships 2014 and 2015 with the agreement of the Austrian Judo Federation to do the first trauma statistic with the associated technical and tactical preparation of Austrian judoka.

MATERIAL & METHODS

The analysis of the audio-visual records of the “care system” of all medal fights of the weight categories organized by cup system during the Austrian Judo Championships in 2014 and 2015 are the center point of the research process. At all, 69 medal fights, 42 male and 27 female fights, were analyzed. All fights got competed and so there were 84 male and 54 female judoka in competition. In these 69 fights 98 scores and 19 interventions by medical doctors were registered. The judo fight caused injuries of the year 2015 were documented by a specially designed trauma protocol for the mat doctors. The injuries of the championship in 2014 were classified by video analysis by a medical doctor. All effective techniques and documented injuries were registered in a SPSS protocol and analyzed according to year, gender, technique classification (e.g. standing technique), technique group (e.g. hip technique) and technique name (e.g. “o goshi” – great hip throw), technique side, score, fighting time, type of injury (e.g. distortion), injured body part, injured structure / tissue, length of treatment by the mat doctor and necessary hospitalization. The classification of the successful judo technique follows the description and official names of the Kōdōkan Judo techniques – only the sacrifice techniques (“ma sutemi waza” - sacrifice techniques to the back and “yoko sutemi waza” - sacrifice techniques to the side) are summarized in one classification category. The effectiveness of the techniques was estimated by Austrian national referees on the basis of the Judo rules by the International Judo Federation. (Ijf, 2014) For the statistical analysis SPSS (IBM) statistic program was used. The program was also used to apply the Chi-square test in order to determine the significance level for the difference of the number of interventions through medical doctors depending on the sex of the fighter at $p < 0,1$.

RESULTS

At all, 69 medal fights, 42 male and 27 female fights, were analyzed. All fights were competed and so there were 84 male and 54 female judoka in competition. In these 69 fights 98 scores and 19 interventions by medical doctors were registered.

Distribution of scores in gold and bronze medal fights

Table 1 shows the number of scores by effective techniques and penalties in gold medal fights and bronze medal fights for male and female fighters. We have taken into count as scores yuko, wazaari, wazaari awasete ippon, ippon (independent from the technique use), penalties (shido) and disqualification (hansokumake) by penalty or injury.

SCORES & PENALTIES	<i>gold</i>		<i>bronze</i>	
	<i>male</i>	<i>female</i>	<i>male</i>	<i>female</i>
<i>scores</i>	91,3%	90,9%	89,2%	96,2%
<i>penalties</i>	8,7%	9,1%	10,8%	3,8%
TOTAL	100%	100%	100%	100%

Table 1: Scores in gold and bronze medal fights by sex

It has to be said that in each weight category there were two bronze medal fights and only one fight for the gold medal. That means that in order to compare the scores the data was normalized. The quantification of scores and penalties seems to be very homogenous from a statistical point of view. But in particular the ratio of scores and penalties is higher in the female bronze medal fights than in the rest. The percentage of penalties is only a third in the female bronze medal fights compared to the other medal fights.

The next logical step was to analyze the nature of the registered scores.

Distribution of scores

Table 2 gives a detail view about the different scores made by male and female participants in all medal fights.

<i>SCORES</i>	<i>male sex</i>	<i>female sex</i>
<i>yuko</i>	34,4%	29,7%
<i>wazaari</i>	24,6%	35,1%
<i>ippon</i>	29,5%	21,6%
<i>wazaari awasete ippon</i>	1,6%	8,1%
<i>shido</i>	6,6%	2,7%
<i>hansoku make</i>	3,3%	2,7%
<i>TOTAL</i>	<i>100%</i>	<i>100%</i>

Table 2: Scores in all medal fights by sex

On one hand the distribution of the scores showed a higher rate of wazaari (half point) (+10,5%) and wazaari awasete ippon (composite win of two half points) (+6,5%) by women. On the other hand males were more effective and scored more ippon (full point) (+7,9%) and received more penalties (e.g. shido) (+4,9%).

The latter could be due to two factors:

- a) men may fight more in standing posture then women
- b) men may fight in a more tactical way to punish the opponent

A second important difference is the about four times higher rate of warazaari awasete ippon of women then men. This may be caused by the reason that women finished their fights either by a second wazaari on the floor or a second wazaari from standing posture, while it seems that men scored more ippon by direct attacks.

In order to analyze this we have to separate the scores of standing and ground techniques. This is reflected in table 3.

<i>POSTURE</i>	<i>both sex</i>	<i>male sex</i>	<i>female sex</i>
<i>standing posture</i>	86,6%	89,1%	82,9%
<i>ground posture</i>	13,4%	10,9%	17,1%
<i>TOTAL</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>

Table 3: Scoring-posture by sex

Table 3 shows that men won more fights by scoring from standing postures, while women won more fights in ground posture (which is related to the fact that they score more half points).

The higher rate of scores from ground techniques was caused by the ability of women to perform follow up techniques (combination of a throwing technique and a linked ground technique).

However we have not mentioned the type of specific score technique. This is depicted in table 4.

<i>TECHNIQUE TYPE</i>	<i>male sex</i>	<i>female sex</i>
<i>direct</i>	32,8%	27,0%
<i>counter</i>	27,9%	29,7%
<i>follow up</i>	29,5%	37,8%
<i>penalty</i>	8,2%	5,4%
<i>injury</i>	1,6%	0%
<i>TOTAL</i>	<i>100%</i>	<i>100%</i>

Table 4: Type of scoring-technique by sex

Table 4 shows that men got more scores by non-judo specific techniques (injuries and penalties) than women. Women scored less direct techniques and more counter techniques and much more follow up techniques than men.

This might be due to physiological constitution of women who are principally less powerful and therefore they execute less explosive direct techniques, forcing to win with a combination of techniques.

Table 5 takes into count the two different combinations that lead to get a score, standing technique followed by a standing technique and standing technique followed by a ground technique.

<i>FOLLOW UP TYPE</i>	<i>male sex</i>	<i>female sex</i>
<i>standing posture – standing posture</i>	66,7%	57,1%
<i>standing posture – ground posture</i>	33,3%	42,9%
<i>TOTAL</i>	<i>100%</i>	<i>100%</i>

Table 5: Type of effective follow up techniques by sex

A closer analysis of table 5 comes to the result that women used more grappling techniques on the ground after bringing the opponent to the floor with an standing technique than men.

Distribution of medical intervention needed injuries

Before we mentioned the scoring by non-judo specific techniques: penalties and injuries. Now in this section we are going to discuss the injuries.

This topic is not only important for winning a championship but also for medical purposes (prevention, therapy and logistic of medical resources).

Table 6 shows the values concerning the numbers of fight interruptions for medical intervention of men and women fights. Chi-square-analysis shows a significant difference ($p < 0.1$) between the sexes. In total, 19 interruptions for medical treatment were necessary at the championship for both sexes (15 for men, 4 for women).

<i>MEDICAL INTERVENTIONS</i>	<i>male sex</i>	<i>female sex</i>
<i>no</i>	82,2%	92,6%
<i>yes</i>	17,8%	7,4%
<i>TOTAL</i>	<i>100%</i>	<i>100%</i>

Table 6: medical interventions by sex

The rate of medical intervention for men was 15/84 and 4/54 for women. From this data we can say that in medal fights the percentage of injuries of men was about 18% and it was much lower for women (7%), although one fighter was disqualified.

All injuries were not serious enough for a hospital treatment. The medical doctor was treating all injured fighters for less than 10 minutes per intervention.

It is also interesting to know that more medical interventions were needed for bronze medal fights than for gold ones – there was only one injury in a gold medal fights, but 14 injuries in bronze medal fights. This could be partially due to the tactics used during the fight since the loser of the bronze medal fight gets no reward.

We have also quantified the distribution of the injured body parts.

<i>INJURED BODYPARTS</i>	<i>male sex</i>	<i>female sex</i>
<i>face</i>	9,1%	0%
<i>nose</i>	27,3%	25%
<i>mouth</i>	9,1%	0%
<i>ellbow</i>	9,1%	0%
<i>hand & fingers</i>	27,3%	50%
<i>thorax / abdomen</i>	9,1%	0%
<i>knee</i>	0%	25%
<i>toes</i>	9,1%	0%
<i>TOTAL</i>	<i>100%</i>	<i>100%</i>

Table 7: injured bodyparts by sex

Table 7 shows that men had a higher number of injured body parts than women. The high rate of injuries of hand and fingers is related to the importance of the grip fight.

To identify the reasons of injuries we registered the posture where the injury happened and the injury causing techniques and presenting them in table 8 and table 9.

<i>POSTURE AT INJURY</i>	
<i>standing posture</i>	93,3%
<i>ground posture</i>	6,7%
<i>TOTAL</i>	<i>100,0%</i>

Table 8: fighting posture at injury

<i>INJURY CAUSED TECHNIQUE GROUP</i>	
grip fight	80,0%
sacrifice throwing techniques	6,67%
joint locking techniques	6,67%
leg throwing techniques	6,67%
<i>TOTAL</i>	<i>100,0%</i>

Table 9: injury caused technique group

The main injury causing technique category was the grip fight in standing posture.

Other reasons for medical interventions were sutemi waza (sacrifice throwing techniques), kansetsu waza (joint locking techniques) and ashi waza (leg throwing techniques).

DISCUSSION

This study is to the best of our knowledge the first one concerning the Austrian Championship. Literature research delivered no results, which compared the technical approach of the competition participants and the occurred injuries. This shows that this research topic is getting more interesting.

First we will focus on the scores. Sterkowicz et al analyzed in his publication “Techniques frequently used during London Olympic judo tournaments: A biomechanical approach” from 2012 the number of scores by throwing and grappling techniques by frequently used techniques at the Olympic judo tournament in London 2012. At the Olympic Games in London 2012 were 359 throws and 77 grappling techniques scored by men and women. These are 436 scores in total – 82% throwing techniques and 18% grappling techniques. In comparison with the distribution of throwing and grappling techniques at the Austrian Championships in 2014 & 2015 – 86,6% throwing and 13,4% grappling techniques – we see that the ratio of throwing techniques is higher in Austria and the ratio of grappling techniques is higher at the Olympics. (Sterkowicz *et al.*, 2013)

Adam et al analyzed in his publication “tactical – technical preparation of judo athletes participating in Japan championships” from 2013 frequently used techniques and their efficiency at the Japanese Judo Championships in the open category during the years 2003-2009. The open category of the Japanese Championship is only for male fighters. The analysis of the Japanese techniques shows 83% throwing and 17% grappling techniques. The ratio for male judoka at the Austrian Judo Championships in 2014 and

2015 is 89,1% for throwing and 10,9% for grappling techniques. The comparison presents a higher use of grappling techniques by male Japanese judoka. (Adam *et al.*, 2013)

Attilio Sacripanti, an Italian physicist and famous researcher on Judo, described in his book “Advances in Judo Biomechanics Research” published in 2010 the power consumption of uke (defender) and tori (the judoka who attacks) depending to the fighting posture. The attacking judoka needs more power in standing posture to exercise control over his opponent then the defender. But in ground posture these conditions are vice versa. Out of it follows that the use of grappling techniques is more effective because it decreases the own power consumption and is weakening the opponent. The technical and tactical preparation of a fighter should consider this knowledge. (Sacripanti, 2010a)

Now we will focus on the injuries. Pocecco et al noticed in their publication “Injuries in Judo: a systematic literature review” from 2013 the same fact as our literature research shows two years later - there is only limited knowledge of epidemiological injury data in judo. In this scientific paper they analyzed the judo associated injuries of the athletes of the Olympic judo tournament at the Olympic Games in 2008 (Peking) and 2012 (London). Pocecco et al. came to the result that the most frequently injuries were sprains, strains and contusions usually of knee, shoulder and fingers. Severe injuries were quite rare at the Olympic judo tournaments in 2008 and 2012. These results are similar to the injuries at the analyzed judo tournaments in Austria. (Pocecco *et al.*, 2013)

Poecce et al described also that nearly 85% of judo injuries occurred during standing fight compared with ground fight. In our analysis 93,3% of the injuries happened in standing posture. The reason for the higher rate in Austria may be the lower using rate of grappling techniques compared with the international level. (Adam *et al.*, 2013)

Pierantozzi et al described in the scientific paper “Judo high competitions injuries” in 2009 that fingers were indicated as the most common injury location during judo competitions as the consequence of the grip fight. Even at the Austrian judo championships a high rate of finger injuries is detectable and the main reason of finger injuries is also the grip fight. (Pierantozzi e Muroi, 2009)

Frey et al reported in his publication “Neuf saisons de surveillance médicale de compétitions de judo” from 2004 a higher frequency of injuries in lower level judo competitions compared with higher level competitions. This finding is also detectable in our analysis of the number of injuries in gold and bronze medal fights. The number of injuries in bronze medal fights is much higher than in gold medal fights at the Austrian championships of 2014 and 2015. (Frey, 2004)

CONCLUSION

Our study leads to the conclusion that gender determines the fighting style and also the risk of an injury. Men use more direct techniques and women more follow up techniques. This knowledge of the rate of technique used due to the gender of the athlete should be considered in the training schedule and preparation for tournaments. The way of training may influence the scorings because of applied techniques and combinations can be a surprise for the opponent. The higher rate of follow up techniques by women is a more efficient way to win a fight. It seems that men want to win by ippon through a throwing technique because they do not follow the opponent on the ground as women do. The importance of the grip fight is reflected of the high rate of injuries of hand and fingers. The high rate of interruptions in men fights is very dubious because also tactical reasons can lead to a false injury. Also the high rate of winner by penalty should be scrutinized because the correlation between the winner by penalty and the athleticism of the sportsmen does not have to be very significant. A big technique repertoire and efficient techniques are a more effective punishment for an opponent than a penalty. Small scores – like koka or yuko – would be a better feedback for the active fighter because penalties do not convey an active winning process and are not the goal of the spirit of judo. The injury analysis shows that judo in ground posture (for example randori newaza) is a harmless way of practicing judo with a lower risk of injuries. This fact should be implemented in the organization of training for all performance groups of judoka, specially for "old" and retired fighters, because injury prevention is an important aspect of increasing the performance.

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GLOSSAR

ashi waza – leg or foot technique

hansoku make - disqualification

IJF – International Judo Federation

ippon - highest contest score; contest decision for winning by a successfully technique; full point

kansetsu waza – joint lock technique

katame waza – grappling techniques

Kodokan - Judo institute in Tokyo, Japan, where Judo was founded by Jigoro Kano

koshi waza – hip technique

ma sutemi waza – supine sacrifice technique

nage waza – throwing techniques

osae komi waza – pinning technique

ÖJV – Österreichischer Judo Verband, Austrian Judo Association

shido – light penalty

shime waza – strangling technique

te waza - hand technique

waza-ari – middle contest score for a great advantage; half point; the only cumulative score

waza-ari awasete ippon – victory by cumulation of two waza-ari

yoko sutemi waza – side sacrifice technique

yuko – smallest contest score for a moderate advantage