COMPARISON OF TECHNICAL AND TACTICAL PARAMETERS FOR ELITE JUDO ATHLETES BASED ON WEIGHT AND GENDER CATEGORIES

Farruh Ahmedov[1]*, Novica Gardašević[2], Edi Setiawan[3], Alisher Olimov[4], Olimjon Muqimov[4], Komilov Jamoliddin[5], Khudaiberdieva Khuriyat[6], Rakhimjon Yusupov[1]

[1]Samarkand State University, Uzbekistan; [2]Primary School "Blažo Mraković", Danilovgrad Montenegro; [3]Universitas Suryakancana, Indonesia; [4]Jizakh State Pedagogical University, Uzbekistan; [5]Chirchik State Pedagogical Institute, Uzbekistan; [6]Tashkent Economy and Pedagogical Institute, Uzbekistan

Abstract

Technical-tactical indicators of judo athletes play an important role in judo. The aim of this study was to compare technical-tactical indicators of combat activities of qualified judokas by weight and gender categories. National judo competitions were analyzed to collect the data and time durations of the contests, ratios of scores end by (ippon/wazari) and penalties, ratios of standing and groundwork techniques, the most dominant techniques were identified. The study results confirmed that women judo contests statistically differential from men judo fights. Also, in both genders light weigh categories fight in standing posture (nage waza), and contests end before regular time was statistically significant than heavyweight category athletes. On the other hand, uchimata, seoi nage, ouchi gari, and uchimata sukashi were among the most frequently employed techniques by judokas in both male and female categories. The results of this study can be used in the training programs to evaluate judo athletes' technical-tactical profile. In additional, the findings are can be implement creating new paradigm of training process.

Keywords: Judo. Technique. Tactics. Weigh Categories

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*Corresponding Author: Farruh Ahmedov, Samarkand State University, Uzbekistan

Correo-e: a-farrux@samdu.uz

Introduction

Indeed, achieving high performance in sports, including judo, is intricately linked to the technical and tactical proficiency of athletes during competitive activities (Ahmedov et.al., 2024). The athlete's ability to execute techniques effectively and adapt strategically within the dynamic environment of competition significantly influences their success (Bompa et.al., 2019). Therefore, the development of training programs aimed at enhancing technical and tactical skills is paramount in preparing athletes for the demands of judo competition (Sterkowicz et.al., 2012; Barreto et.al., 2022). Moreover, the ever-evolving landscape of judo, including regular changes in refereeing rules, introduces additional complexity to the sport. These rule modifications not only affect the technical and tactical aspects of competitive judo but also necessitate continuous analysis and adaptation by athletes and coaches (Barreto et. al., 2022). Understanding how rule changes influence the dynamics of judo matches is essential for optimizing training methodologies and ensuring athletes remain competitive in an evolving sporting environment. Indeed, organizing the training process of qualified judokas must align closely with the demands of competitive activity, necessitating regular analysis of various technical-tactical indicators. The dynamic nature of judo matches, characterized by alternating periods of effort and pause (Segedi et.al., 2014; Franchini et.al., 2014), coupled with evolving refereeing rules, underscores the importance of continuous monitoring and analysis of competition activity.

Technical-tactical features, such as the execution of throws, ground techniques, and strategic decision-making, play a pivotal role in determining the outcome of judo matches (Miarka et.al., 2014). Furthermore, the duration of time spent in different phases of competition, including both active engagement and periods of rest, can vary significantly across different weight and gender categories. As refereeing rules evolve, so too do the technical-tactical strategies employed by judokas (Ahmedov et.al., 2020). Therefore, coaches must adapt training methodologies to align with these changing requirements, ensuring that athletes are equipped to navigate the intricacies of contemporary judo competition. This necessitates ongoing analysis of competition data to identify trends, patterns, and areas for improvement, which can inform the development of targeted training programs. By systematically analyzing technical-tactical indicators and other aspects of competition activity, coaches can tailor training sessions to address specific strengths and weaknesses, optimize athletes' performance, and enhance their competitive readiness. This iterative process of analysis and adaptation ensures that training preparations remain aligned with the evolving demands of judo competition, ultimately maximizing athletes' potential for success on the mat. The findings from various studies regarding the differences in technical-tactical actions among judokas across different weight categories shed light on the intricate relationship between morphology, fighting techniques, and competitive performance in judo. Research has consistently shown that lightweight judokas tend to exhibit a higher frequency of technical-tactical actions compared to their heavyweight counterparts. This observation can be attributed to several factors, including differences in physical attributes, agility, and speed, which are typically more pronounced in lighter weight categories (Franchini et.al., 2011). Lightweight and middleweight judokas are often characterized by enhanced mobility and agility, allowing them to execute a wider array of techniques and maneuvers during matches (Ahmedov et.al., 2020). Furthermore, the role of morphological characteristics cannot be overlooked in understanding the choice of fighting techniques among judokas in different weight divisions. Each weight category encompasses judokas with distinct body compositions, proportions, and physical attributes, which may influence their tactical preferences and the efficacy of certain techniques (Degoutte et.al., 2003; Boguszewski, 2011).

According to the best knowledge we have, the data shows that there has been no previous research to compare technical-tactical aspects among judokas athletes. Therefore, the aim of this study was to compare technical-tactical indicators of combat activities of qualified judokas by weight and gender categories.

Materials and methods

Procedure

The research process involved the analysis of judo competitions held in the Republic of Uzbekistan across the span of 2021-2022. Specifically, data was collected from three significant events: the National Judo Cup (Khorexm-2021), the National Championship (Tashkent-2021), and the National Judo Cup (Termez-2022). A total of 249 video recordings of these competitions were meticulously analyzed, comprising 128 recordings of male judokas and 121 recordings of female judokas.

The video footage of the competitions, provided by the National Judo Federation, served as the primary source of data for the analysis. Three experts, each holding a 3rd DAN black belt and possessing over 10 years of judo experience, were tasked with evaluating the footage. These experts employed their extensive knowledge and expertise to assess various technical and tactical aspects of the judo matches, ensuring a comprehensive and insightful analysis.

By leveraging the collective expertise of these experienced judo practitioners, the research team was able to conduct a thorough examination of the technical-tactical indicators exhibited by qualified judokas across different weight and gender categories. The multi-faceted analysis encompassed a range of performance metrics, including the execution of throws, success rates, ground techniques, penalty counts, and other critical factors influencing competitive performance in judo.

The rigorous methodology employed in this research endeavor underscores the commitment to generating robust and reliable findings that can inform coaching practices and training strategies in judo. By drawing insights from real-world competitive scenarios and leveraging the expertise of seasoned judo professionals, this study aims to contribute meaningfully to the advancement of judo training methodologies and the optimization of athlete performance in international tournaments, including Continental and World Championships,

as well as the Olympic Games.

Measures

The measures utilized in the analysis of technical-tactical indicators of judo competition dynamics include:

Time Durations of the Contests. This measure involves recording the duration of each judo match, from the start to the finish, to understand the pacing and intensity of the contests.

Ratios of Contests Ending with Scores (Ippon/Wazaari) and Penalties. This measure assesses the outcomes of matches by calculating the ratio of contests that end with decisive scores (Ippon or Wazaari) compared to those that end with penalties, providing insights into the effectiveness of offensive versus defensive strategies employed by athletes.

Ratios of Scores Taken by Standing (Nage Waza) and Groundwork (Katame Waza) Techniques. This measure evaluates the distribution of scoring techniques utilized in judo matches, distinguishing between techniques executed in standing position (Nage Waza) and those executed on the ground (Katame Waza), highlighting the strategic preferences and strengths of competitors.

Ratios of the Most Dominant Techniques by Gender Categories. This measure identifies the prevalence of specific techniques employed by judokas in each gender category, offering insights into gender-specific tactical approaches and the efficacy of various techniques in competitive scenarios.

By systematically analyzing these technical-tactical indicators, researchers can gain a comprehensive understanding of the dynamics of judo matches, including the patterns of engagement, strategic preferences, and effectiveness of different techniques utilized by athletes across various weight and gender categories. These measures provide valuable insights for coaches, athletes, and sports scientists seeking to optimize training programs, refine strategic approaches, and enhance competitive performance in judo.

Data analysis

The ANOVA was used to identify the values and differences of the samples. The significance level was set at $p < 0.05$. In this investigation personal information of the athletes was not used, there are no ethical issues in analyzing or interpreting these data.

Results

Based on the results obtained (Table 1), it can be seen that the number of judo fights in the men's category that last less than full time is equal to the number of fights that end in 4 minutes (full time) and overtime (Golden Score). Based on the above, in the men's category, no statistically significant differences were found in the duration of fights, that is, those fights that end shorter than the scheduled time and fights that last a full time or time in overtime.

Unlike judokas, in the women's category, in all weight categories except for the category - 48 kg, judo fights last less than the scheduled full time (4 minutes). The obtained differences are also statistically significant.

The obtained results point to the importance of understanding the dynamics and duration of matches in judo competitions, as they can inform training and preparation strategies to better equip athletes for the challenges of competitive matches (Table 1).

The results achieved by judokas serve as a key indicator of their skill level and effectiveness in competition. In this study, it was observed that a number of results for both male and female judokas ended in ipona, with 49% of results in male bouts and 61% in female bouts. A statistically significant difference between fights ending with ippon and fights ending with wazaari was found only in the women's category. However, a notable statistical disparity emerged when comparing ippon scores attained by female judokas to matches that concluded with wazaari scores and penalties. When analyzing judokas by weight categories, it was noted that contests in the -73 kg and -90 kg weight categories for men, and the -52 kg weight category for women, often concluded with ippon or wazaari scores. This suggests that judokas in these weight categories exhibit a higher propensity for decisive scoring techniques.

Furthermore, it is important to highlight that in both gender categories, matches resulting in penalties were significantly less frequent compared to matches ending with ippon and wazaari scores, with only 6% of men's matches and 7% of women's matches culminating in penalties. This underscores the emphasis placed on offensive techniques and decisive scoring in judo competition. Overall, these findings underscore the importance of effective scoring techniques, particularly ippon victories, in determining the outcome of judo matches (Table 2).

The mutual ratio of scores obtained in the standing position (Nage waza) and on the ground (Katame waza) varied significantly among male and female judokas, as illustrated in Table 3. Statistically, there was a notable difference between the scores obtained in standing and ground positions for both genders. Specifically, only 13,33% of points were scored on the ground in male judo matches, whereas this figure was slightly higher at 16,07% for female judokas. When analyzing by weight categories, it was observed that the percentage of scores obtained by male judokas in weight categories under -66 kg (95,24%) and -60 kg (90,00%), as well as for female athletes in weight categories under -70 kg (93,33%) and -52 kg (92,31%), was higher in the standing position compared to other weight categories. However, no statistically significant difference was observed between the weight categories.

These findings suggest that there is a notable discrepancy in the distribution of scores between standing and ground positions in judo matches, with a higher proportion of scores being achieved through techniques executed in the standing position. Additionally, while certain weight categories exhibit a higher prevalence of scoring in the standing position, there were no statistically significant differences observed among weight categories.

Overall, these insights provide valuable information for coaches and athletes, highlighting the importance of proficiency in both standing and ground techniques across different weight categories in judo competition. Understanding these patterns can inform training strategies aimed at optimizing scoring opportunities and enhancing overall performance on the mat (Table 3).

Table 4 presents the most commonly used techniques by male and female judokas, along with their respective ratios. It is noteworthy that the dominant techniques employed by male and female judokas exhibit some variation in terms of the number of techniques utilized. Specifically, male judokas commonly utilized a total of 22 techniques, whereas female athletes favored 18 throwing techniques in competition.

Interestingly, certain techniques such as Uchimata, Seoi nage, Ouchi gari, and Uchimata sukashi were among the most frequently employed techniques by judokas in both male and female categories. This suggests that these techniques are versatile and effective across different genders and weight categories, highlighting their prominence in judo competition.

Out of 22 judo techniques used by judokas at the analyzed competitions, as many as 8 techniques (Tomoe nage, Osoto gari, Tani otoshi, Tai otoshi, Deashi harai, Harai goshi, Uchimata makikomi, Morote gari and Kuzure shiho gatame) were not used by female judokas at all. On the other hand, out of 18 judo techniques used by female judokas, only 4 techniques (Sukuri nage, Kosoto

Table 1. Duration of contests by gender and weight categories (n = 249).

Weight categories	End before regular time	End in regular time	End in Golden score	Weight categories	End before regular time	End in regular time	End in Golden score
-60kg	11	4	7	-48kg	7	6	2
-66kg	9	5	8	-52kg	8	4	1
-73kg	7	6	5	-57kg	12	6	4
-81kg	9	4	5	-63kg	10	5	3
-90kg	10	4	4	-70kg	9	6	1
-100kg	8	3	3	-78kg	13	6	5
Over 100kg	9	4	3	Over 78kg	8	3	2
Total male	63***	30	35	Total female	67**	36*	18

*** significant differences between the frequency of ending contests before regular time and ending it in regular time or/and ending it in golden score time.

** significant differences between the frequency of ending contests before regular time and ending it in regular time.

* significant differences between the frequency of ending contests in regular time and ending it in golden score time.

Table 2. Frequency of scores achieved by male and female judokas (n = 249).

Weight categories	Ippon	Wazaari	Penalty	Weight categories	Ippon	Wazaari	Penalty
-60kg	11	9	2	-48kg	9	5	1
-66kg	9	12	1	-52kg	11	2	0
-73kg	7	11	0	-57kg	12	9	1
-81kg	9	8	1	-63kg	10	7	1
-90kg	10	8	0	-70kg	11	4	1
-100kg	8	4	2	-78kg	13	8	3
Over 100kg	9	5	2	Over 78kg	8	3	2
Total male	63***	57**	8	Total female	74*	38**	9

*** significant differences between the frequency of ippon and penalty.

** significant differences between the frequency of wazaari and penalty.

* significant differences between the frequency of ippon and wazaari.

Table 3. Frequency of scores achieved in ground (Katame Waza) and standing fight (Nage Waza).

Weight categories	Ground techniques	Standing techniques	Weight categories	Ground techniques	Standing techniques
-60kg	2	18	-48kg	2	12
-66kg	1	20	-52kg	1	12
-73kg	2	16	-57kg	3	18
-81kg	2	15	-63kg	5	12
-90kg	4	14	-70kg	1	14
-100kg	3	9	-78kg	4	17
Over 100kg	2	12	Over 78kg	2	9
Total male	16*	104	Total female	18*	94

*Significant differences between the scores obtained Katame waza and Nage waza

Table 4. Comparison of dominant techniques used by male and female judokas.

Techniques	Number	Techniques	Number	Techniques	Number
Male judokas		**Female judokas**		**Male and female judokas**	
Uchimata	11	Uchimata	13	Uchimata	24
Uchimata sukashi	10	Seoi nage	12	Seoi nage	21
Seoi nage	9	Ouchi gari	11	Ouchi gari	20
Ouchi gari	9	Ura nage	10	Uchimata sukashi	19
Kososto gari	9	Kouchi gari	9	Kouchi gari	17
Kouchi gari	8	Uchimata sukashi	9	Ura nage	17
Tomoe nage	8	Kososto gari	7	Kosoto gari	16
Ura nage	7	Soto makikomi	6	Soto makikomi	9
Osoto gari	7	Sukuri nage	5	Hon kesa gatame	9
Tani otoshi	6	Kosoto gake	4	Kami shiho gatame	8
Tai otoshi	4	Uki otoshi	4	Osoto otoshi	6
Deashi harai	4	Osoto otoshi	3	Morote gari	6
Osoto otoshi	3	Morote gari	3	Yoko shiho gatame	6
Soto makikomi	3	Hon kesa gatame	7	Kata gatame	3
Harai goshi	3	Tate shiho gatame	5	-	-
Uchimata makikomi	3	Kami shiho gatame	3	-	-
Morote gari	3	Yoko shiho gatame	2	-	-
Kami shiho gatame	5	Kata gatame	1	-	-
Yoko shiho gatame	4	-	-	-	-
Kuzure shiho gatame	3	-	-	-	-
Hon kesa gatame	2	-	-	-	-
Kata gatame	2	-	-	-	-
Total	**120**	**Total**	**112**	**Total**	**181**

gake, Uki otoshi and Tate shiho gatame) were not used by judokas at all (Table 4).

Discussion

The taken results based on our observations showed that technical-tactical aspects of the judokas in different weight and gender categories were differentiated from each other. The results of this work confirmed the importance and significance of using these findings in the preparation process of qualified judokas. The refereeing rule changes in judo served to create an intense and spectacular competition process. On the other hand, this changes led to a change in specific technical and tactical indicators of the competitive activity of judokas. It should be noted that during the study it was confirmed that most of the struggles finished before the regular time. If we approach this from a training point of view, then such a result creates the need to act intensively throughout the entire competitive process. Further studies have determined that competitions of this level require a high physiological, physical and psychological potential from a judoka at the same time (Calmet et.al., 2017; Drid et.al., 2013). Under such conditions, there is no chance to win the competition by any tactical ways (prolonging time, take off the belt, rest between commands Hajime and Mate). Today, there are relatively many cases of victory in judo competitions as a result of ippon. According to the results of studies for the period 2005-2010, during this period there were

very common cases where the outcome of the fight was determined by the number of penalties or by the Golden Score (Gardasevic & Stankovic, 2019.). The difference that has arisen is related to the change in competition rules in recent years and the modification of the judo training system. However, other studies note that the number of penalties in female are lower than male judokas, while the scores are higher. And there was no statistical difference in weight categories (Adam et.al., 2013). These results are significant in the sense that over time the results of judo competitions become more and more different. Constant monitoring and analysis of competition results is one of the most important factor that guarantee a stable result.

Uchimata as the "queen of throws" in judo, which belongs to the side techniques (koshi waza) turned out to be the most frequently used technique at the championships analyzed in both sexes. At the Olympic Games that were held in London in 2012, the uchimata technique was the most dominant technique among female judokas, while it was the second most frequently used technique among judokas, right behind the Morote seoi nage technique (Adam et.al., 2011). Also, the Uchimata sukashi technique is justified in a high position among the most dominant techniques, according to the fact that it is a manual technique that opposes the attack of the Uchimata technique, which indicates that judokas at the highest levels of competition develop defense according to the frequency of dominant attacking techniques. The foregoing justifies the need to conduct such research, which contributes to the possibility of developing a better judo fighting strategy based on the results obtained. The first three dominant techniques: Uchimata (Koshi waza), Seoi nage (Te waza) and Ouchi gari (Ashi waza) belong to different groups of judo techniques, which indicates the need for maximum technical and tactical preparation of the judoist in order to achieve the best results. The analysis of the most commonly used judo techniques provides a clearer picture of judo fights in the competition, differentiates the techniques whose application dominates the fight, and therefore decides the winner. The analysis conducted can have practical application and contribute to judo coaches in planning the training process, especially in the planning of the competition strategy and tactics (Sertic et.al., 2009).

When comparing the frequency of scores obtained in the standing posture (Nage Waza) and in the groundwork (Katame Waza), a similarity can be noticed with previous studies (Table 3). In some studies, it has also been noted that the hold down technique (Katame Waza) is highly effective compared to other techniques (Shavkatovich, 2020: Brabec et.al., 2024). The latest IJF Refereeing rules greatly encourage the holding of fights in the standing position. But the development of the most optimal portion for groundwork fights and the fights in standing position in certain weight categories also indicates the need for an individual tactical approach. In particular, it can be concluded that this situation in male judokas is associated with their weight categories, which depend on anthropometric indicators (Kozina et.ak., 2018). Lightweight judokas are more likely to use standing techniques, which increases the chances of getting a score (Miarka et.al., 2014; Brabec et.al., 2024). In cases where the techniques performed while standing do not give the desired result, they always have the opportunity to continue the competition on the ground. For this reason, it is observed that the scores obtained in the groundwork fighting are relatively low level. In addition, technical-tactical indication of judo athletes in different age and gender categories can be connected with integral training (Kozina et.al, 2018). Because, integral training is also crucial part of the preparing process.

Conclusion

In conclusion, the comparative analysis of technical-tactical indicators among qualified judokas across various weight and gender categories provides valuable insights into the nuanced aspects of judo performance. Through meticulous examination and statistical analysis, we have identified significant differences and similarities in the execution of throws, success rates, ground techniques, penalty counts, and other crucial performance metrics. This study underscores the importance of considering weight and gender distinctions when evaluating judo performance, as these factors play a significant role in shaping athletes' strategies and outcomes on the mat. The findings suggest that while certain technical-tactical indicators may vary across weight and gender categories, there are also shared patterns and skills that transcend these distinctions. Practical implications of this analysis extend to coaches, athletes, and sports scientists, who can leverage these insights to tailor training programs, refine coaching methodologies, and optimize performance strategies for judokas of different weights and genders. By understanding the intricacies of how weight and gender influence technical-tactical performance in judo, practitioners can enhance their ability to nurture talent, mitigate weaknesses, and foster a more inclusive and effective training environment.

As the sport of judo continues to evolve, future research endeavors should delve deeper into the underlying mechanisms driving these observed differences and explore novel methodologies to enhance performance analysis. By embracing a multidimensional approach that considers not only weight and gender but also biomechanical, psychological, and strategic factors, we can further advance our understanding of judo performance and elevate the standard of excellence in this dynamic and captivating martial art.

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