

New kata evaluation in top-level karate: analysis of frequency and score of katas in K1 Premiere League

Authors' Contribution:

- A Study Design
- B Data Collection
- C Statistical Analysis
- D Manuscript Preparation
- E Funds Collection

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Received: 02 June 2020; Accepted: 15 June 2020; Published online: 22 June 2020

AoBID: 13641

Abstract

Background and Study Aim:

With the new kata evaluation procedure, seven judges evaluate the kata. Scores are given according to the technical and athletic presentation of the katas. This improvement could cause changes in competition trends. The goal of the study was the knowledge about frequency and score of performed katas at the 2019 Karate 1 Premiere League.

Material and Methods:

A total of 2,190 kata were performed (1,137 in the male and 1,053 in the female category). All performed katas during the season were recorded. Chi-square tests and ANOVA were conducted.

Results:

The most performed katas were Suparinpei (14.3%) followed by Anan Dai (13.7%), Papuren (13.1%), Chatanyara Kushanku (9.3%) and Anan (8.5%). In general and in female category, the most successful kata in all factors was Oydomari no Passai which was not used very often. In male category it was Kosokun Sho in total and technical score, Sochin in athletic score. In general, the most unsuccessful katas was Heiku, Kosokun Sho in female, Enpi in male category. There is a significant relationship between gender and choice of katas. Female athletes prefer Papuren, while male athletes prefer Anan Dai. There was not a significant difference in score between male and female athletes.

Conclusions:

To progress to the next round, karatekas perform longer and more complex kata than before the rules change. This, however, does not guarantee higher score. Shorter katas have lower score and therefore are used less. As male and female competitors choose different katas and achieve different score, training should also be differentiated based on gender.

Key words:

athletic score • performance • technical score • total score

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Conflict of interest:

Authors have declared that no competing interest exists

Ethical approval:

The study was approved by the local Ethics Committee

Provenance & peer review:

Not commissioned; externally peer-reviewed

Source of support:

This study was supported by a Scientific Grant Agency of the Ministry of Education of Slovak Republic VEGA No. 1/0654/19

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Karate – martial art originating from Japan, practitioners use their hands and feet to deliver and block blows.

Kata – meaning literally “form”, is a detailed choreographed pattern of movements made to be practised alone or in groups and in unison when training. It is practised as a way to memorise and perfect the movement being executed.

Kumite – is a semi-contact karate competitive concurrence, where two athletes perform various kicking, punching and blocking techniques towards each other with maximum control in order to gain points and win the match. Destruction is fictive.

Karate WKF – according to World Karate Federation, karate has been recognised as an Olympic sport since 2016 and it has been added to the sports programme for the Olympic Games Tokyo 2021.

Technical score – awarded based on the evaluation of stances, techniques, transitional movements, timing, correct breathing, focus and conformance demonstrated by a karateka whilst performing their kata.

Athletic score – awarded based on the evaluation of speed, strength and balance demonstrated by a karateka whilst performing their kata.

Total score – weighed 70% for technical performance and 30% for athletic performance, it is calculated by the elimination of the two highest and two lowest scores for respectively technical performance and athletic performance.

Tactics – the optimal and effective use of sport motor skills on the basis of a corresponding level of motor characteristics for the realization of the main idea of a sport discipline, often within the framework of a larger-scale strategy.

INTRODUCTION

There have been many changes to the Olympic style of karate during the latest Olympic cycle. One of the key factors of those changes might be the fact that the participation in the Olympic Games (OG) depends exclusively on WKF Olympic standing, which is contingent on the points received in top-level competitions. As a number of karatekas strive to compete in the OG, number of participants in top-level competitions has increased. Consequently, changes in competition rules as well as competition system has been implemented.

Maximum 64 athletes from top 100 in WKF ranking can compete in Karate 1 Premiere League. There are several rounds of registration, e.g. in the first round only top 50 karatekas (with max. 2 from the same country) can enter. An athlete may acquire necessary points in Series A qualification tournament.

Karate kata are executed as a specified series of a variety of moves with stepping and turning, while attempting to maintain a perfect form.

In the new kata evaluation procedure, technical and athletic performances are examined. A panel formed by seven judges evaluates the performances, and scores are given according to the technical and athletic presentation of the katas. The software system automatically eliminates the two highest and two lowest scores for both criteria; the total amount of points is calculated by the factor of 70% for technical performance and 30% for athletic performance. The evaluation for technical performance includes: stances, techniques, transitional movements, timing, correct breathing, focus (“kime”) and conformance (consistency in the performance of the kihon of the style *Ryu-ha* in the kata), while the athletic performance evaluation is based on strength, speed and balance [1].

The first bow of the kata starts the performance evaluation and the last bow concludes it. All the competitors participating in a WKF event are divided into pools of eight karatekas, with the four competitors getting the highest scores moving into the next round. Athletes with lesser points will be eliminated until only two groups of eight competitors remain. At this stage, the top three competitors from both pools will qualify for the final bouts, with the second and third-ranked karatekas from each group competing

for bronze and the two top athletes clashing for gold. Number of katas performed to win depends on number of athletes. Usually it is four or five rounds, ergo katas.

In order to achieve top-level performance it is necessary for the coaches to be aware of the structure of sport performance, competition structure and demands on karateka. Detailed analysis of this kind of data can be considered vital for karate and strength and conditioning coaches in terms of physiological as well as tactical preparation of their athletes. Top level karate competition is reaching higher level and minor mistakes make a considerable difference in athletes’ results. For this reason, there is a strong need for conducting detailed research and analysis of the frequency and successfulness of katas chosen by karatekas at top-level competitions.

Competitors choose their katas based on the round of the bout, how challenging is their opponent, and their current training level. The order of katas, however, must be carefully planned as a kata can only be used once in a particular competition. Different techniques, jumps, and length of kata should be taken into consideration as well. All those demands make it essential for karateka to choose their katas tactically [2]. There are only few studies that inquire into kata in competition [2-4], majorly concerning physiological demands [5-7]. Some other karate studies focus on time-motion in kumite fight [8, 9]. Nonetheless, trends outlined in aforementioned studies have evolved substantially as a consequence of changes in competition system and rules. Karate has been transitioning to a professional sport.

The goal of the study was the knowledge about frequency and score of performed katas at the 2019 Karate 1 Premiere League.

MATERIAL AND METHODS

Data collecting

All performed katas during the WKF top-level karate events in year 2019 were recorded.

The study focuses on the 7 consecutive Karate 1 Premiere Leagues held in January (Paris, France), February (Dubai,) April (Rabat, Morocco), June (Shanghai, China), September (Tokyo, Japan), October (Moscow, Russia), and November (Madrid,

Spain) and four A Series March (Salzburg, Austria), May (Istanbul, Turkey), June (Montreal, Canada), and September (Santiago, Chile).

The point lists in all individual kata categories for both genders were obtained from the website of the Sportdata – World Karate Federation section [http://www.sportdata.org]. Data of the performed katas in each round was collected using excel tables with check-off forms that described the competitor's sex, name of performed kata, athletic, technical and total score. No names or any other personal information was registered to guarantee anonymity.

Subjects

The sample consisted of 2,091 athletes (1,105 male, 986 female) who competed at the investigated top-level karate events. These athletes are top-level national representatives who attempt to reach the highest WKF ranking positions for selection to the Continental Karate Championships, the World Karate Championships and Olympic Games.

Statistical analysis

The statistical analyses were carried out using the SPSS 21.0 program for Windows (SPSS, Inc., Chicago, IL, USA). Data's normality was checked through the Shapiro-Wilk test.

Data are expressed as mean \pm SD, percentages and 95% confidence intervals (CI), where relevant.

For comparison of score One-way ANOVA was conducted. A Chi-square test was used to analyse if there was statistically significant relationship between the choice of kata and gender. The significance level of $p < 0.05$ was used.

RESULTS

During the top-level karate events 2019 a total of 2,190 katas were performed (1,137 in the male and 1,053 in the female category).

Number of performed katas depends on the number of entries; top-level kata medallists had to perform 5 katas. The most performed kata were *Suparinpei* (14.3%) followed by *Anan Dai* (13.7%), *Papuren* (13.1%), *Chatanyara Kushanku* (9.3%) and *Anan* (8.5%).

Athletes performed 31 (30%) katas from the list but they had different preferences (Table 1). There is a significant relationship between gender and choice of katas ($\chi^2(2, n = 1,605) = 253.0, p = 0.00$). Female athletes preferred *Shito Ryu* katas *Papuren* (22.5%), *Suparinpei* (16.0%), *Anan*

Table 1. The most performed katas at the Karate 1 Premiere League per gender karate athletes (n = 2,091).

Female athletes (n = 986)			Male athletes (n = 1,105)		
Kata	Count	%	Kata	Count	%
Papuren	237	22.5	Anan Dai	156	13.7
Suparinpei	169	16.0	Suparinpei	144	12.7
Anan Dai	145	13.8	Unsu	138	12.1
Chatanyara Kushanku	139	13.2	Gojushiho Sho	109	9.6
Anan	85	8.1	Anan	101	8.9
Gojushiho Dai	48	4.6	Gankaku	98	8.6
Gojushiho Sho	38	3.6	Gojushiho Dai	79	6.9
Chibana no Kushanku	36	3.4	Chatanyara Kushanku	65	5.7
Unsu	34	3.2	Kanku Sho	52	4.6
Kururunfa	28	2.7	Papuren	49	4.3
Gankaku	24	2.3	Ohan Dai	38	3.3
Kanku Sho	14	1.3	Sansai	33	2.9
Ohan	8	0.8	Ohan	20	1.8
Ohan Dai	7	0.7	Chibana no Kushanku	16	1.4
Paiku	7	0.7	Kururunfa	11	1.0

Female athletes (n = 986)			Male athletes (n = 1,105)		
Kata	Count	%	Kata	Count	%
Tomari Bassai	7	0.7	Paiku	8	0.7
Nipaipo	5	0.5	Enpi	5	0.4
Sochin	5	0.5	Nipaipo	4	0.4
Enpi	3	0.3	Pachu	3	0.3
Oyadomari no Passai	3	0.3	Kusanku	2	0.2
Sansai	3	0.3	Shisochin	2	0.2
Heiku	2	0.2	Chinto	1	0.1
Kosokun Dai	2	0.2	Gojushiho	1	0.1
Gojushiho	1	0.1	Kosokun Dai	1	0.1
Kusanku	1	0.1	Seisan	1	0.1
Nijushiho	1	0.1	Heiku	0	0
Unshu	1	0.1	Nijushiho	0	0
Chinto	0	0	Oyadomari no Passai	0	0
Pachu	0	0	Sochin	0	0
Seisan	0	0	Tomari Bassai	0	0
Shisochin	0	0	Unshu	0	0
Total	1053	100	Total	1137	100

Dai (13.8%), *Chatanyra Kushanku* (13.2%) and *Anan* (8.1%), while male athletes preferred *Anan Dai* (13.7%), *Suparinpei* (12.7%), *Unsu* (12.1%), *Gojushiho Sho* (9.6%) and *Anan* (8.9%).

In general and in female category, the most successful kata in all factors (technical score 18.67 ± 0.69 , athletic score 7.90 ± 0.36 , and total score 26.57 ± 1.03) was *Oyadomari no Passai* which was not used very often (0.3%). The score of all performed katas are present in Tables 2-4.

In male category it was *Kosokun Sho* in total score (24.75 ± 0.39), *Kosokun Sho* in technical score (17.41 ± 0.22), and *Sochin* in athletic score (7.42 ± 0.33). The most unsuccessful katas are *Heiku* (21.11 ± 0.98) in general, *Kosokun Sho* (20.47 ± 1.46) in female category and *Enpi* (20.90 ± 1.54) in male category. There was not a significant difference in score between male and female athletes (technical $F(1) = 1.71$, $p = 0.19$, athletic $F(1) = 2.21$, $p = 0.13$, total score $F(1) = 0.07$, $p = 0.79$).

Table 2. Technical score of performed katas during the season of the Karate 1 Premiere League 2019 karate athletes (n = 2,091).

Female athletes (n = 986)				Male athletes (n = 1,105)			
Kata	Mean	95% CI		Kata	Mean	95% CI	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
Oyadomari no Passai	18.52	17.50	19.53	Kosokun Sho	17.41	16.88	17.94
Unshu	17.64	3.41	31.87	Sochin	17.28	16.59	17.97
Kururunfa	17.22	16.93	17.51	Shisochin	17.20	16.43	17.96
Chibana no Kushanku	17.00	16.63	17.36	Kyan no Chinto	16.94	13.38	20.50
Ohan Dai	16.96	16.35	17.57	Chatanyara Kushanku	16.49	16.25	16.73
Chatanyara Kushanku	16.78	16.60	16.95	Chibana no Kushanku	16.37	15.93	16.81
Sansai	16.38	15.22	17.54	Kururunfa	16.14	14.20	18.09

Female athletes (n = 986)				Male athletes (n = 1,105)			
Kata	Mean	95% CI		Kata	Mean	95% CI	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
Paiku	15.73	15.20	16.26	Ohan Dai	16.08	14.73	17.43
Unsu	15.56	14.81	16.30	Nipaipo	15.98	15.10	16.86
Anan	15.53	14.84	16.21	Anan Dai	15.77	15.27	16.26
Papuren	15.51	15.06	15.96	Anan	15.70	15.06	16.35
Tomari Bassai	15.48	13.13	17.82	Pachu	15.68	13.74	17.62
Sochin	15.40	13.56	17.24	Ohan	15.49	13.57	17.41
Gankaku	15.30	14.23	16.36	Suparinpei	15.48	14.94	16.02
Suparinpei	15.27	14.68	15.85	Gojushiho Sho	15.48	15.05	15.91
Anan Dai	15.24	14.64	15.84	Papuren	15.30	14.29	16.31
Nipaipo	15.10	13.82	16.38	Unsu	15.22	14.72	15.72
Gojushiho Sho	15.07	14.45	15.70	Kanku Sho	15.20	14.38	16.03
Enpi	15.07	11.62	18.52	Gankaku	14.89	14.04	15.74
Ohan	15.01	11.60	18.41	Paiku	14.85	12.33	17.37
Heiku	14.84	9.50	20.18	Sansai	14.67	13.05	16.29
Kanku Sho	14.72	13.32	16.12	Enpi	14.58	13.42	15.75
Kosokun Sho	14.33	11.88	16.77	Kusanku	8.61	-100.79	118.01

Table 3. Athletic score of performed katas during the season of the Karate 1 Premiere league 2019. The most performed katas at the Karate 1 Premiere League per gender karate athletes (n = 2,091).

Female athletes (n = 986)				Male athletes (n = 1,105)			
Kata	Mean	95% CI		Kata	Mean	95% CI	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
Oyadomari no Passai	7.83	7.30	8.35	Sochin	7.42	7.00	7.84
Unshu	7.65	3.20	12.10	Shisochin	7.40	7.03	7.77
Kururunfa	7.30	7.18	7.41	Kosokun	7.33	6.82	7.85
Chibana no Kushanku	7.25	7.10	7.41	Ohan Dai	7.23	6.86	7.60
Ohan Dai	7.24	6.97	7.51	Kyan no Chinto	7.15	5.24	9.06
Chatanyara Kushanku	7.14	7.07	7.22	Kusanku	7.12	3.56	10.68
Ohan	7.01	6.74	7.28	Chatanyara Kushanku	7.05	6.96	7.15
Sansai	6.92	6.46	7.38	Chibana no Kushanku	7.01	6.81	7.22
Gankaku	6.76	6.61	6.90	Nipaipo	6.80	6.43	7.17
Unsu	6.74	6.50	6.98	Pachu	6.73	5.86	7.61
Suparinpei	6.70	6.50	6.90	Papuren	6.71	6.33	7.08
Papuren	6.64	6.45	6.83	Anan Dai	6.68	6.46	6.91
Tomari Bassai	6.63	5.62	7.64	Anan	6.68	6.39	6.97
Nipaipo	6.53	5.99	7.06	Ohan	6.62	5.80	7.45
Sochin	6.50	5.75	7.26	Sansai	6.60	6.01	7.19
Anan	6.50	6.18	6.83	Kururunfa	6.56	5.43	7.69
Anan Dai	6.41	6.14	6.69	Unsu	6.55	6.34	6.76
Gojushiho Sho	6.41	6.15	6.68	Gankaku	6.55	6.24	6.86

Female athletes (n = 986)				Male athletes (n = 1,105)			
Kata	Mean	95% CI		Kata	Mean	95% CI	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
Heiku	6.25	3.07	9.43	Suparinpei	6.50	6.26	6.75
Paiku	6.19	4.80	7.59	Kanku Sho	6.47	6.09	6.85
Kosokun Sho	6.17	4.94	7.39	Gojushiho Sho	6.46	6.23	6.68
Kanku Sho	6.04	5.22	6.85	Paiku	6.34	5.26	7.41
Enpi	5.18	1.33	9.03	Enpi	6.32	5.86	6.77

Table 4. Total score of performed katas during the season of the Karate 1 Premiere League 2019.

Female athletes (n = 986)				Male athletes (n = 1,105)			
Kata	Mean	95% CI		Kata	Mean	95% CI	
		Lower Bound	Upper Bound			Lower Bound	Upper Bound
Oyadomari no Passai	26.33	24.80	27.86	Kosokun Sho	24.75	23.78	25.72
Unshu	25.26	6.45	44.07	Ohan Dai	24.72	24.19	25.24
Kururunfa	24.52	24.11	24.92	Sochin	24.70	23.66	25.75
Chibana no Kushanku	24.25	23.74	24.76	Shisochin	24.58	23.48	25.68
Ohan Dai	24.19	23.32	25.05	Ohan	24.50	23.98	25.02
Chatanya Kushanku	23.92	23.68	24.17	Kururunfa	24.21	23.48	24.94
Papuren	23.66	23.50	23.83	Kyan no Chinto	24.05	18.59	29.51
Ohan	23.59	22.66	24.52	Sansai	23.91	23.48	24.34
Suparinpei	23.48	23.19	23.77	Anan	23.77	23.52	24.03
Anan Dai	23.48	23.29	23.66	Papuren	23.74	23.38	24.11
Tomari Bassai	23.41	22.18	24.64	Anan Dai	23.74	23.52	23.95
Anan	23.34	23.05	23.63	Kusanku	23.66	11.01	36.32
Sansai	23.30	21.68	24.93	Chatanya Kushanku	23.54	23.21	23.87
Unsu	22.90	22.51	23.29	Suparinpei	23.45	23.17	23.74
Gankaku	22.78	22.28	23.27	Gankaku	23.43	23.18	23.68
Gojushih	22.73	22.48	22.99	Chibana no Kushanku	23.39	22.75	24.03
Paiku	22.50	21.78	23.22	Gojushiho Sho	23.31	23.12	23.50
Kanku Sho	21.94	21.28	22.61	Kanku Sho	23.12	22.77	23.47
Sochin	21.92	19.35	24.49	Unsu	23.03	22.82	23.24
Nipaipo	21.62	19.82	23.42	Nipaipo	22.77	21.54	23.99
Enpi	21.50	16.63	26.37	Paiku	22.71	21.97	23.45
Heiku	21.11	12.34	29.88	Pachu	22.42	19.68	25.16
Kosokun Sho	20.47	16.85	24.08	Enpi	20.90	19.29	22.52

DISCUSSION

It seems that the new competition format brings not only a new organization of the competition but also new trends in kata competition performance, e.g. the number of required katas decreased from 7 to 5.

Before the change of rules, the draw allowed the athletes to show more than one kata. The athletes with lower level of performance had lower chance to pass to the second round and on the other hand two very high level athletes could compete in one of the first rounds. So nowadays,

the competitions is more objective and the final result of the competition is not based on chance.

On the other hand, athletes do not have the opportunity to use “shorter” katas like *Heiku*, *Paiku*, *Pachu* or *Enpi* in the first round. According to the previous WKF rules, both technical and athletic scores were equally important in the evaluation. Currently, as can be seen in the Tables 2-4, they would be awarded insufficient amount of points. New rules ascribe 70% from the total evaluation to technical score, so the athletes use longer katas in which they can showcase their strengths.

When we compare previous study about K1 competition [2] and European Championships [3], athletes prefer similar katas as before – *Annan*, *Gojushiho Sho*, *Suparinpai*, *Unsu*, *Chatanyara Kushanku*, however in a different order. In the season 2019 *Annan* was much lower on the list of the most used katas and the longer version of this kata *Annan Dai* was used much often. In female category kata *Papuren* is used the most often. In addition, these kata are also popular in competition in younger categories – young cadets, cadets, juniors and U21 [4]. Therefore, it is not surprising that the highest scores are awarded to those kata that are technically demanding and at the same time rarely appear in the competition like *Ohan Dai*, *Oyadomari no Passai* and *Unshu*. Similar phenomenon can be seen in youth categories [4]. In 2015, kata *Papuren* was introduced at the World Championships by the female champion. Since then, popularity of this kata increased drastically to the extent of being on the top of the most performed kata list. *Papuren* may be considered elegant from the motoric point of view and therefore is preferred by female athletes. As show in the Table 1, male karatekas do not perform this kata quite so frequently.

Some of mentioned katas have been scientifically researched, such as *Annan*, *Unsu* [6], *Gankaku* [10], *Heian Nidan* [11] and *Pinan* [5] but the research was focused on the physiological demands of the kata in such indicators as lactate, heart rate, VO₂max etc. However, these indicators do not evaluate performance according to the attributes of the WKF competition rules [1] in the manner judges would. The athletic score criteria are strength, speed and balance. There are studies focused on these indicators, but they are only investigating basic movements such as leg flexion or extension [12].

Only two studies try to define the technical complexity of the performance [13]. The authors attempt to define technical difficulty using the tagging template which counts number of individual karate movements (punches, strikes, stances, transitions) and based on that define the coefficient of difficulty.

Argajova et al. [14] compared technical composition and total score of the 5 most used katas during Karate1 season 2015 [2] and found out that katas with higher slow to fast movement ratio (the ones with more movements and performed faster) receive higher score from the judges as apparent from results such as in *Chatanyara Kushanku*. Table 1 shows that athletes intuitively choose kata with the highest ratio scale. From our point of view, it would be impossible for the judges to remember 102 katas. Based on our results we suggest to shorten the list of kata and divide them into separate groups. These steps can increase the objectivity of the kata evaluation.

LIMITATIONS OF THE STUDY

The study includes only top-level karate athletes and it is focused exclusively on Olympic-style karate.

CONCLUSIONS

To progress to the next round, karatekas perform longer and more complicated and complex kata. This, however, does not guarantee higher score. Shorter katas have lower score and therefore are used less. As male and female competitors choose different katas and achieve different score, training should be differentiated based on gender as well.

HIGHLIGHTS

Karate kata competition system has been evolving rapidly. As the conditions for karatekas keep changing, there emerges the need for analysing new conditions. Those analyses provide the most current knowledge base for all involved parties (athletes, coaches, etc.) which should result in the increase in the training process efficiency.

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Cite this article as: Novosad A, Argajova J, Augustovicova D. New kata evaluation in top-level karate: analysis of frequency and score of katas in K1 Premiere League. *Arch Budo* 2020; 16: 153-160