

## KINESIOLOGY & COACHING

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### ***Kata* selection after the full adoption of the scoring system at the top-level *karate* competitions**

Submission: 16.11.2022; acceptance: 31.12.2022

**Key words:** *karate*, age categories, competition, World Karate Federation

#### **Abstract**

**Background.** The new *kata* competition rules were implemented in 2019 with a one-year transition period.

**Problem and aim.** The main goal of the study is to describe the selection and successfulness of selected types of *kata* performed at the 2021 WKF top-level *karate* competitions. The secondary goal is to find out if there is an association between gender and the *kata* selection, and differences in *kata* selection across the age categories from round to round.

**Methods.** All performed types of *kata* during the eleven WKF top-level *karate* events of the season 2021 were recorded. Athletes' country, sex, age category, name of the performed *kata*, technical, athletic, and total score, promotion to the next round (pass or did not pass to the next round, or win/lose in medal bouts), and ranking were recorded. Descriptive statistics and the Chi-square tests for the analysis were used. A total of 2,579 *kata* ensembles were performed (1,263 in the male and 1,316 in the female category, 861 in the cadets, 741 in the juniors, 101 in the U21, and 876 in the seniors' categories).

**Results.** The most performed *kata* in the season 2021 was: Gojushiho (503, 19.5 %), followed by Papuren (345, 13.4%) Anan Dai (287, 11.1%) Suparinpei (200, 7.8%), Chatanyara Kushanku (169, 7, 6.6%). The most successful *kata* in the first round was Kuru-runfa (75,3%). The highest average score had those types of *kata* which were performed rarely such as Kyan No Kushanku, Tomari Bassai, Kishimoto No Kushanku. The most unsuccessful *kata* to pass to the 2nd round was Chatanyara Kushanku (24.3%) and the lowest average score had Seizan (19.70±2.15).

**Conclusion.** Coaches and athletes should select the *kata* carefully to raise the chance to pass to the next round. The higher chance to pass to the next round or win the medal bout have types of *kata* with high movement frequency or *kata* performed rarely. Coaches should differentiate the *kata* selection according to gender. It seems referees do not meaningfully evaluate performed *kata* ensembles but rather selected the best athletes for the next round.

#### **Introduction**

The World Karate Federation (WKF) is the largest international governing body of sport *karate*. It is the only *karate* organization recognised by the International Olympic Committee and has more than ten million members from 200 countries) [World Karate Federation 2022].

At the WKF top-level *kata* competitions, each karateka can select a *kata* from the WKF official list

of *kata* (102 in total). The panel of seven judges are giving points (5.00 to 10.00 with 0.2 increment) after the completion of the *kata* performance according to the technical and athletic performance, together giving the total score. These two components of the *kata* evaluation have different factors, technical 70% (0.7) and athletic 30% (0.3), respectively. The WKF top-level competition consist of four rounds. In the latest model of competition, the athletes are seeded into the eight

groups. In the second round the number of groups is reduced to four and in the third round to two. In 1<sup>st</sup> and 2<sup>nd</sup> rounds, first four athletes of each group with the highest score pass to the next round. In the third round (the ranking round) the competitors with the highest score in each of the two respective groups are pitted against each other competing for 1<sup>st</sup> place (the loser taking 2<sup>nd</sup> place). The competitors obtaining the second highest score in each of the two groups are pitted against competitors obtaining the third highest score in the other group to compete for the two 3<sup>rd</sup> places (bronze finals) [World Karate Federation 2019].

Before the implementation of the new rules Brazilian competition with repechage was used and athletes had to perform from 5 to 7 *kata* to reach a medal. When we compare previous studies [Augustovicova *et al.* 2019; Augustovicova *et al.* 2018; Cierna 2014] we can conclude that the competition format and rules have a significant influence on the *kata* selection. Moreover, the adoption of WKF's new scoring system allows for more nuanced scoring for a *kata* performance than the previous flag system. This outdated system only provided information how a *kata* performance did relative to one opponent's performance. The new scoring system provides better feedback for coaches and athletes about the quality of the performance as well as potentially help spectators understand the decision. The new system also makes an athlete drawing less of an extrinsic factor in determining the final rank placement of competitors [Clark 2022].

The new *kata* competition rules were implemented in 2019 with a one-year transition period but there were no WKF top-level competitions in 2020 because of the Covid-19 restrictions.

The main goal of the study is to describe the selection and successfulness of performed types of *kata*. Further, technical, athletic, and total score of selected *kata* ensembles at the 2021 WKF top-level karate competitions after the full adoption of the new *kata* competition rules were evaluated. The secondary goal is to find out if there is an association between gender and the *kata* selection, and differences in *kata* selection across the age categories.

## Methods

### Sample

The sample consisted of 1,399 athletes (688 male, 711 female) of 4 age categories, Cadets (n=465), Juniors (n=417), U21 (n=57) and Seniors (n=460), who competed at the investigated top-level karate events in the season 2021. These athletes were top-level athletes who attempt to reach the highest WKF ranking positions for selection to the Continental, World Karate Championships, or Olympic Games.

### Data collection

All performed *kata* ensembles during all eleven WKF top-level karate events of the season 2021 were recorded (Karate1 Premier League – Istanbul, Lisbon, Cairo, Moscow; WKF Senior World Championships – Dubai; EKF Senior Championship – Porec; Karate Youth League – Limassol, Porec, Istanbul, Venice; and EKF Junior, Cadet & U21 Championship – Tampere).

The point lists (Draw records) in all individual *kata* categories for both genders were obtained from the website of the Sportdata – World Karate Federation section [<http://www.sportdata.org>]. Sportdata Software for professional event management provides online freely available data. Data of the performed types of *kata* in each round was collected using excel tables with check-off forms that described athletes' sex, age category (cadets 14-15, juniors 16-17, U21 18-20 and seniors +16 years old), name of the performed *kata*, technical, athletic, and technical score, and the promotion to the next round (pass or did not pass to the next round, or win/lose in medal bouts).

We used public data, no names or any other personal information was registered to guarantee anonymity. Therefore, the ethical approval was not necessary to conduct this study.

### Statistical analysis

The statistical analyses were carried out using the SPSS 21.0 program for Windows (SPSS, Inc., Chicago, IL, USA). Descriptive statistics and the Chi-square test were used to analyse if there was statistically significant relationship between the selection of *kata* and gender. Percentage of *kata* successfulness was calculated for each round. The significance level of  $p < 0.05$  was used.

## Results

### Kata selection

Athletes performed 33 (32%) types of *kata* out of 102 in the official WKF *kata* list. The number of performed types of *kata* at the competition depends on the number of entries and top-level *kata* medallists had to perform between 3 and 4 *kata* ensembles in 3 or 4 rounds.

The most performed *kata* in the season 2021 was: Gojushiho (503, 19.5%), followed by Papuren (345, 13.4%) Anan Dai (287, 11.1%) Suparinpei (200, 7.8%), and Chatanyara Kushanku (169, 7, 6.6%).

Gojushiho was the most performed *kata* in the first three rounds of the competition followed by Anan Dai and Papuren. In the 4<sup>th</sup> round (medal bout) Chatanyara Kushanku, Gankaku and Suparinpei were the most performed types of *kata*.

There is a significant relationship between gender and the *kata* selection (Table 1). Female athletes performed different types of *kata* than male athletes.

**Table 1.** The most performed types of kata in the season 2021 per gender

| Kata                  | Gender |        |      |        | Total | %      |
|-----------------------|--------|--------|------|--------|-------|--------|
|                       | Female | %      | Male | %      |       |        |
| GOJUSHIHO SHO         | 218    | 16.6%  | 285  | 22.6%  | 503   | 19.5%  |
| PAPUREN               | 266    | 20.2%  | 79   | 6.3%   | 345   | 13.4%  |
| ANAN DAI              | 140    | 10.6%  | 147  | 11.6%  | 287   | 11.1%  |
| SUPARINPEI            | 107    | 8.1%   | 93   | 7.4%   | 200   | 7.8%   |
| CHATANYARA KUSHANKU   | 121    | 9.2%   | 48   | 3.8%   | 169   | 6.6%   |
| UNSU                  | 48     | 3.6%   | 121  | 9.6%   | 169   | 6.6%   |
| ANAN                  | 71     | 5.4%   | 91   | 7.2%   | 162   | 6.3%   |
| KANKU SHO             | 43     | 3.3%   | 96   | 7.6%   | 139   | 5.4%   |
| OHAN DAI              | 29     | 2.2%   | 81   | 6.4%   | 110   | 4.3%   |
| KURURUNFA             | 55     | 4.2%   | 30   | 2.4%   | 85    | 3.3%   |
| GANKAKU               | 29     | 2.2%   | 55   | 4.4%   | 84    | 3.3%   |
| CHIBANA NO K.         | 67     | 5.1%   | 11   | .9%    | 78    | 3.0%   |
| SANSAI                | 24     | 1.8%   | 50   | 4.0%   | 74    | 2.9%   |
| PAIKU                 | 22     | 1.7%   | 17   | 1.3%   | 39    | 1.5%   |
| NIPAPO                | 19     | 1.4%   | 9    | .7%    | 28    | 1.1%   |
| OHAN                  | 7      | .5%    | 11   | .9%    | 18    | .7%    |
| ENPI                  | 1      | .1%    | 11   | .9%    | 12    | .5%    |
| HEIKU                 | 10     | .8%    | 0    | 0.0%   | 10    | .4%    |
| TOMARI BASSAI         | 10     | .8%    | 0    | 0.0%   | 10    | .4%    |
| KISHIMOTO NO KUSHANKU | 6      | .5%    | 2    | .2%    | 8     | .3%    |
| PACHU                 | 0      | 0.0%   | 7    | .6%    | 7     | .3%    |
| BASSAI DAI            | 4      | .3%    | 2    | .2%    | 6     | .2%    |
| SOCHIN                | 3      | .2%    | 2    | .2%    | 5     | .2%    |
| KANKU DAI             | 2      | .2%    | 2    | .2%    | 4     | .2%    |
| KOUSOUKU              | 2      | .2%    | 2    | .2%    | 4     | .2%    |
| SEIPAI                | 2      | .2%    | 2    | .2%    | 4     | .2%    |
| KYAN NO KUSHANKU      | 3      | .2%    | 0    | 0.0%   | 3     | .1%    |
| SHISOCHI              | 1      | .1%    | 2    | .2%    | 3     | .1%    |
| UNSHU                 | 2      | .2%    | 1    | .1%    | 3     | .1%    |
| KUSANKU               | 0      | 0.0%   | 2    | .2%    | 2     | .1%    |
| OYADOMARI PASSAI      | 2      | .2%    | 0    | 0.0%   | 2     | .1%    |
| SEISAN                | 1      | .1%    | 1    | .1%    | 2     | .1%    |
| SHIHO KO              | 0      | 0.0%   | 2    | .2%    | 2     | .1%    |
| MATSUMURA BASSAI      | 1      | .1%    | 0    | 0.0%   | 1     | .0%    |
| SANSEIRU              | 0      | 0.0%   | 1    | .1%    | 1     | .0%    |
|                       | 1316   | 100.0% | 1263 | 100.0% | 2579  | 100.0% |

**Table 2.** The most performed types of *kata* in the season 2021 per age category

| Kata                  | Cadets |       | Juniors |       | U21 |       | Seniors |       | Total |       |
|-----------------------|--------|-------|---------|-------|-----|-------|---------|-------|-------|-------|
|                       | N      | %     | N       | %     | N   | %     | N       | %     | N     | %     |
| GOJUSHIHO SHO         | 124    | 14.4% | 107     | 14.4% | 16  | 15.8% | 141     | 16.1% | 345   | 13.4% |
| ANAN DAI              | 90     | 10.5% | 89      | 12.0% | 11  | 10.9% | 97      | 11.1% | 314   | 12.2% |
| PAPUREN               | 87     | 10.1% | 86      | 11.6% | 11  | 10.9% | 88      | 10.0% | 287   | 11.1% |
| ANAN                  | 67     | 7.8%  | 63      | 8.5%  | 10  | 9.9%  | 81      | 9.2%  | 200   | 7.8%  |
| SUPARINPEI            | 64     | 7.4%  | 51      | 6.9%  | 10  | 9.9%  | 65      | 7.4%  | 185   | 7.2%  |
| GOJUSHIHO DAI         | 60     | 7.0%  | 48      | 6.5%  | 7   | 6.9%  | 62      | 7.1%  | 169   | 6.6%  |
| KANKU SHO             | 58     | 6.7%  | 45      | 6.1%  | 7   | 6.9%  | 54      | 6.2%  | 169   | 6.6%  |
| CHATANYARA KUSHANKU   | 51     | 5.9%  | 44      | 5.9%  | 7   | 6.9%  | 52      | 5.9%  | 162   | 6.3%  |
| UNSU                  | 49     | 5.7%  | 36      | 4.9%  | 5   | 5.0%  | 52      | 5.9%  | 139   | 5.4%  |
| GANKAKU               | 36     | 4.2%  | 27      | 3.6%  | 3   | 3.0%  | 46      | 5.3%  | 110   | 4.3%  |
| CHIBANA NO KUSHANKU   | 32     | 3.7%  | 27      | 3.6%  | 3   | 3.0%  | 29      | 3.3%  | 85    | 3.3%  |
| SANSAI                | 29     | 3.4%  | 24      | 3.2%  | 3   | 3.0%  | 22      | 2.5%  | 84    | 3.3%  |
| OHAN DAI              | 26     | 3.0%  | 23      | 3.1%  | 2   | 2.0%  | 20      | 2.3%  | 78    | 3.0%  |
| KURURUNFA             | 19     | 2.2%  | 18      | 2.4%  | 2   | 2.0%  | 17      | 1.9%  | 74    | 2.9%  |
| PAIKU                 | 11     | 1.3%  | 16      | 2.2%  | 1   | 1.0%  | 11      | 1.3%  | 39    | 1.5%  |
| ENPI                  | 7      | .8%   | 10      | 1.3%  | 1   | 1.0%  | 9       | 1.0%  | 28    | 1.1%  |
| KISHIMOTO NO KUSHANKU | 6      | .7%   | 7       | .9%   | 1   | 1.0%  | 9       | 1.0%  | 18    | .7%   |
| NIPAPO                | 6      | .7%   | 3       | .4%   | 1   | 1.0%  | 7       | .8%   | 12    | .5%   |
| PACHU                 | 6      | .7%   | 3       | .4%   | 0   | 0.0%  | 3       | .3%   | 10    | .4%   |
| HEIKU                 | 5      | .6%   | 3       | .4%   | 0   | 0.0%  | 2       | .2%   | 10    | .4%   |
| BASSAI DAI            | 4      | .5%   | 2       | .3%   | 0   | 0.0%  | 2       | .2%   | 8     | .3%   |
| GOJUSHIHO             | 3      | .3%   | 2       | .3%   | 0   | 0.0%  | 2       | .2%   | 7     | .3%   |
| SOCHIN                | 3      | .3%   | 1       | .1%   | 0   | 0.0%  | 1       | .1%   | 6     | .2%   |
| KANKU DAI             | 2      | .2%   | 1       | .1%   | 0   | 0.0%  | 1       | .1%   | 5     | .2%   |
| KOUSOUKUN SHO         | 2      | .2%   | 1       | .1%   | 0   | 0.0%  | 1       | .1%   | 4     | .2%   |
| KUSANKU               | 2      | .2%   | 1       | .1%   | 0   | 0.0%  | 1       | .1%   | 4     | .2%   |
| OHAN                  | 2      | .2%   | 1       | .1%   | 0   | 0.0%  | 1       | .1%   | 4     | .2%   |
| SEIPAI                | 2      | .2%   | 1       | .1%   | 0   | 0.0%  | 0       | 0.0%  | 3     | .1%   |
| SHISOCHIN             | 2      | .2%   | 1       | .1%   | 0   | 0.0%  | 0       | 0.0%  | 3     | .1%   |
| UNSHU                 | 2      | .2%   | 0       | 0.0%  | 0   | 0.0%  | 0       | 0.0%  | 3     | .1%   |

|                     |     |        |                     |     |      |                 |     |      |                 |     |      |                     |      |     |
|---------------------|-----|--------|---------------------|-----|------|-----------------|-----|------|-----------------|-----|------|---------------------|------|-----|
| KOUSOUKUN DAI       | 1   | .1%    | KOUSOUKUN SHO       | 0   | 0.0% | SANSEIRU        | 0   | 0.0% | KOUSOUKUN SHO   | 0   | 0.0% | KOUSOUKUN DAI       | 2    | .1% |
| SANSEIRU            | 1   | .1%    | KUSANKU             | 0   | 0.0% | SEIPAI          | 0   | 0.0% | KUSANKU         | 0   | 0.0% | KOUSOUKUN SHO       | 2    | .1% |
| SEISAN              | 1   | .1%    | KYAN NO CHINTO      | 0   | 0.0% | SEISAN          | 0   | 0.0% | PACHU           | 0   | 0.0% | KUSANKU             | 2    | .1% |
| SHIHO KOUSOUKUN     | 1   | .1%    | MATSUMURA BASSAI    | 0   | 0.0% | SHIHO KOUSOUKUN | 0   | 0.0% | SANSEIRU        | 0   | 0.0% | OYADOMARI NO PASSAI | 2    | .1% |
| KYAN NO CHINTO      | 0   | 0.0%   | OYADOMARI NO PASSAI | 0   | 0.0% | SHISOCHIN       | 0   | 0.0% | SEIPAI          | 0   | 0.0% | SEISAN              | 2    | .1% |
| MATSUMURA BASSAI    | 0   | 0.0%   | SANSEIRU            | 0   | 0.0% | SOCHIN          | 0   | 0.0% | SEISAN          | 0   | 0.0% | SHIHO KOUSOUKUN     | 2    | .1% |
| OYADOMARI NO PASSAI | 0   | 0.0%   | SHISOCHIN           | 0   | 0.0% | TOMARI BASSAI   | 0   | 0.0% | SHIHO KOUSOUKUN | 0   | 0.0% | MATSUMURA BASSAI    | 1    | .0% |
| TOMARI BASSAI       | 0   | 0.0%   | SOCHIN              | 0   | 0.0% | UNSHU           | 0   | 0.0% | UNSHU           | 0   | 0.0% | SANSEIRU            | 1    | .0% |
|                     | 861 | 100.0% |                     | 741 | 100% |                 | 101 | 100% |                 | 876 | 100% |                     | 100% |     |

**Table 3.** Technical, athletic, and total scores of *kata* performed during the season 2021

| Kata               | Technical |                |       |       | Athletic |                |      |      | Total |                |       |       |
|--------------------|-----------|----------------|-------|-------|----------|----------------|------|------|-------|----------------|-------|-------|
|                    | Mean      | Std. Deviation | Min   | Max   | Mean     | Std. Deviation | Min  | Max  | Mean  | Std. Deviation | Min   | Max   |
| KYAN NO KUSHANKU   | 17.41     | 0.93           | 16.80 | 18.48 | 7.44     | 0.26           | 7.26 | 7.74 | 24.85 | 1.19           | 24.12 | 26.22 |
| TOMARI BASSAI      | 17.11     | 1.26           | 13.86 | 18.06 | 7.25     | 0.59           | 5.76 | 7.68 | 24.36 | 1.85           | 19.62 | 25.62 |
| KISHIMOTO KUSHANKU | 17.10     | 0.42           | 16.52 | 17.80 | 7.37     | 0.19           | 7.08 | 7.56 | 24.34 | 0.54           | 23.60 | 25.06 |
| OHAN               | 16.90     | 1.30           | 14.98 | 19.46 | 7.21     | 0.55           | 6.24 | 8.40 | 24.07 | 1.83           | 21.22 | 27.86 |
| SHIHO KO           | 16.80     | 0.99           | 16.10 | 17.50 | 7.56     | 0.34           | 7.32 | 7.80 | 24.00 | 1.16           | 23.18 | 24.82 |
| OYADOMARI PASSAI   | 16.73     | 1.09           | 15.96 | 17.50 | 7.17     | 0.38           | 6.90 | 7.44 | 23.90 | 1.47           | 22.86 | 24.94 |
| KUSANKU            | 16.59     | 0.30           | 16.38 | 16.80 | 7.35     | 0.21           | 7.20 | 7.50 | 23.85 | 0.64           | 23.40 | 24.30 |
| KURURUNFA          | 16.70     | 1.19           | 13.72 | 19.40 | 7.12     | 0.53           | 5.82 | 8.22 | 23.82 | 1.69           | 19.54 | 27.40 |
| OHAN DAI           | 16.76     | 1.08           | 14.00 | 19.74 | 7.25     | 0.48           | 6.12 | 8.64 | 23.76 | 2.75           | 0.00  | 28.38 |
| SUPARINPEI         | 16.60     | 1.08           | 14.00 | 19.40 | 7.10     | 0.47           | 5.82 | 8.22 | 23.71 | 1.52           | 19.82 | 27.48 |
| CHATANYARA         | 16.60     | 1.14           | 13.16 | 19.88 | 7.13     | 0.50           | 5.58 | 8.58 | 23.65 | 1.56           | 18.74 | 28.46 |
| GANKAKU            | 16.54     | 1.06           | 13.58 | 18.48 | 7.07     | 0.47           | 5.76 | 7.86 | 23.63 | 1.50           | 19.52 | 26.34 |
| CHIBANA            | 16.54     | 0.92           | 14.56 | 18.60 | 7.10     | 0.39           | 6.18 | 7.92 | 23.60 | 1.27           | 20.80 | 26.26 |
| SANSAI             | 16.42     | 1.12           | 13.44 | 18.60 | 7.08     | 0.50           | 5.52 | 7.80 | 23.44 | 1.56           | 18.96 | 25.86 |
| ANAN DAI           | 16.34     | 1.03           | 13.58 | 19.18 | 7.04     | 0.47           | 5.76 | 8.40 | 23.35 | 1.45           | 19.34 | 27.28 |
| HEIKU              | 16.35     | 0.98           | 14.14 | 17.50 | 6.98     | 0.39           | 6.12 | 7.38 | 23.34 | 1.35           | 20.26 | 24.88 |
| PAPUREN            | 16.35     | 1.08           | 13.16 | 19.46 | 7.01     | 0.48           | 5.70 | 8.46 | 23.33 | 1.50           | 18.98 | 27.92 |
| UNSU               | 16.30     | 1.15           | 12.74 | 18.76 | 7.03     | 0.54           | 5.40 | 8.40 | 23.31 | 1.62           | 18.14 | 26.92 |
| PACHU              | 16.32     | 1.20           | 14.14 | 17.80 | 7.14     | 0.29           | 6.60 | 7.44 | 23.26 | 1.54           | 20.20 | 24.94 |
| ANAN               | 16.23     | 1.22           | 13.30 | 19.04 | 6.98     | 0.53           | 5.64 | 8.40 | 23.15 | 1.68           | 18.94 | 27.14 |
| PAIKU              | 16.17     | 0.95           | 12.60 | 17.92 | 6.96     | 0.47           | 5.46 | 7.80 | 23.06 | 1.25           | 18.60 | 25.54 |
| SOCHIN             | 16.02     | 1.21           | 14.28 | 17.22 | 6.91     | 0.47           | 6.36 | 7.44 | 22.93 | 1.67           | 20.64 | 24.66 |
| KANKU SHO          | 15.99     | 1.39           | 12.74 | 18.76 | 6.92     | 0.61           | 5.46 | 8.04 | 22.90 | 1.96           | 18.20 | 26.74 |
| NIPAPO             | 15.94     | 1.23           | 11.76 | 17.64 | 6.83     | 0.53           | 4.92 | 7.38 | 22.78 | 1.76           | 16.68 | 24.96 |
| GOJUSHIHO          | 15.81     | 1.26           | 11.48 | 19.18 | 6.82     | 0.57           | 5.10 | 8.40 | 22.62 | 1.79           | 16.58 | 27.40 |
| SEIPAI             | 15.40     | 0.93           | 14.42 | 16.66 | 6.45     | 0.45           | 5.94 | 6.96 | 21.85 | 1.35           | 20.36 | 23.62 |
| ENPI               | 14.71     | 1.42           | 12.40 | 17.64 | 6.41     | 0.66           | 5.16 | 7.56 | 21.12 | 2.12           | 17.20 | 25.20 |
| SHISOCHIN          | 14.75     | 2.54           | 12.88 | 17.64 | 6.32     | 1.18           | 5.52 | 7.68 | 21.07 | 3.72           | 18.40 | 25.32 |
| KANKU DAI          | 14.67     | 1.79           | 12.74 | 16.52 | 6.42     | 0.95           | 5.40 | 7.26 | 21.04 | 2.70           | 18.14 | 23.78 |
| KOUSOUKU           | 14.70     | 0.93           | 13.44 | 15.68 | 6.26     | 0.26           | 5.88 | 6.48 | 20.96 | 1.19           | 19.32 | 22.16 |
| UNSHU              | 14.33     | 0.21           | 14.14 | 14.56 | 6.18     | 0.06           | 6.12 | 6.24 | 20.51 | 0.26           | 20.32 | 20.80 |
| BASSAI DAI         | 13.91     | 1.38           | 11.90 | 16.10 | 5.91     | 0.75           | 4.86 | 6.90 | 19.73 | 2.05           | 16.76 | 23.00 |
| SEISAN             | 13.79     | 1.68           | 12.60 | 14.98 | 5.91     | 0.47           | 5.58 | 6.24 | 19.70 | 2.15           | 18.18 | 21.22 |





Also, there is a significant relationship between the age category and the *kata* selection (Table 2). *Kata* ranked from the highest to the lowest total score are listed in Table 3. All the types of *kata* with the highest percentage of advancing to the next round or winning the match are listed in Table 4, ranked from the most successful to the least successful *kata*.

## Discussion

The choice of *kata* in the competition season 2021 has changed compared to the season 2019 which has changed compared to the previous seasons 2015 and 2014 [Augustovicova *et al.* 2018; Cierna 2014]. We have confirmed previous findings of Novosad *et al.* [2020] that women and men choose different types of *kata* for the competition. However, the choice in terms of age category was different.

The most performed types of *kata* in the season 2019 were Suparinpei (313, 14.3%) followed by Anan Dai (301, 13.7%), Papuren (286, 13.1%), Chatanyara Kushanku (204, 9.3%) and Anan (186, 8.5%) [Novosad *et al.* 2020]. In the season 2019 Paiku, Gojushiho Dai and Empi were in the list of top 10 performed types of *kata*. But in 2021 were replaced by Papuren, Anan Dai and Ohan Dai. The duration of different types of *kata* is also one side to think over. For example, *kata* Paiku has duration  $112 \pm 9$  sec and Papuren  $180 \pm 12$  sec, which is 50% difference [Augustovicova *et al.* 2021]. Argajova *et al.* [2020] find out that types of *kata* significantly differ in length and number of fast and slow motions and fast-slow ratio. It is obvious that athletes exchange those types of *kata* with shorter duration for longer duration types over the time, probably to emphasise their level of technical and athletic abilities. In longer types of *kata* is also a greater number of techniques, therefore, an experienced karateka has better chance to show his/her strengths. Another explanation for using longer types of *kata* should be reduced number of rounds (4 currently in total) compared to WKF competitions with adopted elimination system before 2019 (5-7 in total), so competitors' reduced accumulated fatigue can affect their choice to a large extent.

Based on our results, we can create a typical model a woman and a man athlete according to the style of karate. Female Shito ryu athlete could perform Papuren, Anan Dai, Suparinpei, and Chatanyara Kushanku while the male Shito ryu athlete could perform Anan Dai, Suparinpei, Anan, and Ohan dai. On the other hand, the selection of Shotokan female and male athletes is similar: Gojushiho sho, Unsu, Kanku sho, Gankaku. Furthermore, we can create a hypothetical model of the most successful *kata* choice regardless of the karate style (Table 5).

However, we can see that the average score of the *kata* that the athletes obtained is different. It may seem

that the height of scores depends mainly on the athlete's performance, but at this level of the competition is the athletes' performances almost equal. For judges could be hard to differentiate from each other and placement for *kata* performances may depend on the judging panel due to the variation in judge scores [Clark 2022].

**Table 5.** Hypothetical model of the most successful strategy for both genders across age categories

| Age category | Gender | Round     |                     |            |                     |
|--------------|--------|-----------|---------------------|------------|---------------------|
|              |        | 1st       | 2nd                 | 3rd        | 4th                 |
| Cadet        | Male   | Anan      | Anan Dai            | Sansai     | Gankaku             |
|              | Female | Papuren   | Chibana no Kushanku | Suparinpei | Gankaku             |
| Junior       | Male   | Paiku     | Gojushiho Sho       | Sansai     | Anan Dai            |
|              | Female | Ohan      | Papuren             | Suparinpei | Chatanyara Kushanku |
| Senior       | Male   | Ohan      | Ohan Dai            | Unsu       | Suparinpei          |
|              | Female | Kururunfa | Chibana no Kushanku | Papuren    | Anan Dai            |

It is interesting that the types of *kata* which received the highest score were performed rarely (0.2% and less). Out of the ten most performed types, Kururunfa reached the highest score, followed by Ohan Dai, Suparinpei, Chatanyara Kushanku and Gankaku.

Hadza *et al.* [2023] find out very small differences in athletic and total scores between male and female athletes. Score is raising with the age category; the differences are significant but the mean difference among cadets (the youngest athletes) and seniors (the oldest athletes) categories is less than 1.0 points. Judges are just selecting the best athlete to the next round. It looks that the high-level athletes have a very good level of performance, and the judges have the best consistency in case of evaluating very good athletes [Clark 2022].

Because of the previous results of Hadza *et al.* [2022] and Clark [2022] we see that the current approach to using the score as the most important value for the *kata* performance analysis is not reasonable. Therefore, to see which types of *kata* are probably more successful we decided to analyse which of them have a higher chance to pass to the next round. It looks that athletes with similar conditions have a higher chance to pass to the 2nd round in Shito ryu style with *kata* Kururunfa, and in next rounds Papuren and Suparinpei. For the medal bout the most successful *kata* was Ohan Dai. Shotokan athletes could be successful performing these types of *kata* in a specific order: Gojushiho Sho, Kanku sho, Gankaku and Gojushiho dai. The most unsuccessful types of *kata* to pass to the next round were Kanku dai, Kosokun dai, Seisan, Kosokun sho, Sanzeru, Sochin and Seipai.

Our study did not confirm the previous findings of Augustovicova *et al.* [2019], youth athletes slightly copied the strategies of their older counterparts. But

in fact, they selected almost the same types of *kata* for the competition. From our point of view, this competition and training habits are not in compliance with the Long-Term Athlete Development. Year-round, single-sport training, frequent participation in competitions, decreased age-appropriate play approach, and involvement in individual sports that requires the early development of specific technical/motor skills can lead to early sport specialization [Myer *et al.* 2015]. Specialized training for young athletes comes with a higher risk of injuries and possible burn-out, while the degree of specialization is positively correlated with increased serious injury risk. To avoid this, WKF commission should create the groups of types of *kata* differentiated according to the age categories. Divide them according to the technical content of *kata* and applying the coefficient of difficulty suggested by Augustovicova *et al.* [2020] or the physiological demands could be appropriate [Augustovicova *et al.* 2021].

Athletes and coaches should change their personal list of competitive *kata* ensembles not only to prevent one-sided overload and burnt out, but to enhance the chance to earn more points using unique and rare *kata*.

Knowing the list of 102 *kata* with their technical specification is difficult. Therefore, based on the observed changes in the athlete's selection, the referees' educational program should be focused on the most performed types of *kata*.

Future sport performance analysis is needed because WKF introduced a new competition format in 2022. The Round Robin format is now applied to the elimination rounds to further raise the competitive level of the tournaments [WKF 2022].

#### LIMITATIONS OF THE STUDY

The study includes only top-level karate athletes. and it is focused exclusively on WKF Olympic- style karate. Therefore, our results are only valid for a given performance level in the monitored tournaments. We did not focus on the national level of competitions, style championships or competitions of other international karate organisations.

#### Conclusions

Coaches and athletes should select the *kata* carefully to raise the chance to pass to the next round. Athletes using high frequency movements or rare types of *kata* have a higher chance to win. They should also differentiate the *kata* selection according to gender. Youth athletes' *kata* selection is similar to seniors' selection. Early sport specialization should be avoided creating groups of types of *kata* according to the age categories.

It seems referees do not give the competitors meaningful evaluation and use the points to select the best athletes for the next round regardless of performed *kata*. Based on the results of this and previous studies, the choice of selected types of *kata* changes with respect to the changes in the rules. Therefore, it is necessary to continue analysing future competitions. The results are helpful not only for the athletes, coaches and tactical preparation for the competition but also for the referees and the sports committees.

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## Selekcja kata po pełnym przyjęciu systemu punktowego na zawodach karate najwyższej rangi

**Słowa kluczowe:** karate, kategorie wiekowe, zawody, World Karate Federation

### Streszczenie

Tło. Nowe zasady zawodów kata zostały wprowadzone w 2019 roku z rocznym okresem przejściowym.

Problem i cel. Głównym celem pracy było opisanie doboru i skuteczności wybranych typów kata wykonywanych na zawodach karate najwyższej rangi WKF w 2021. Drugim celem było ustalenie, czy istnieje związek między płcią a wyborem kata oraz różnicami w wyborze kata w różnych kategoriach wiekowych z rundy na rundę.

Metody. Zarejestrowano wszystkie wykonywane rodzaje kata podczas jedenastu imprez karate na najwyższym poziomie WKF w sezonie 2021. Zanotowane zostały następujące kategorie: kraj zawodników, płeć, kategoria wiekowa, nazwa wykonanego kata, wynik techniczny, sportowy i łączny, awans do następnej rundy (przejdzie lub nie przejdzie do następnej rundy lub wygrana/przegrana w walkach medalowych) oraz ranking.

Do analizy wykorzystano statystyki opisowe oraz testy chi-kwadrat. Łącznie wykonano 2579 sekwencji kata (1263 w kategorii mężczyzn i 1316 w kategorii kobiet, 861 w kategorii kadetów, 741 w kategorii juniorów, 101 w kategorii U21 i 876 w kategorii seniorów).

Wyniki. Najczęściej wykonywanym kata w sezonie 2021 było: *Gojushiho* (503, 19,5%), następnie *Papuren* (345, 13,4%) *Anan Dai* (287, 11,1%) *Suparinpei* (200, 7,8%), *Chatanyara Kushanku* (169, 7, 6,6%). Najbardziej udanym kata w pierwszej rundzie była *Kururunfa* (75,3%). Najwyższy średni wynik miały te rodzaje kata, które były wykonywane rzadko, takie jak *Kyan No Kushanku*, *Tomari Bassai*, *Kishimoto No Kushanku*. Najbardziej nieudanym kata, które nie przeszło do II rundy było *Chatanyara Kushanku* (24,3%), a najniższą średnią ocenę uzyskało *Seizan* (19,70±2,15).

Wnioski. Trenerzy i zawodnicy powinni starannie dobierać kata, aby zwiększyć szansę na przejście do następnej rundy. Większe szanse na przejście do następnej rundy lub wygranie walki o medal mają typy kata o dużej częstotliwości ruchów lub kata wykonywane rzadko. Trenerzy powinni różnicować wybór kata w zależności od płci. Wydaje się, że sędziowie nie oceniają miarodajnie wykonywanych sekwencji kata, a raczej wybierają najlepszych zawodników do następnej rundy.