



Attack side and direction during the 2017 Judo World Championship

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Introduction

During competitions, one of the main goals of judo athletes is to throw their opponents onto their backs, with force and control, to score an ippon, which ends the match [1]. To create the opportunity to apply a throwing technique, judo athletes need to go through the displacement without contact and gripping phases [1]. The judo throwing technique is classically divided in three main phases [2]: (a) kuzushi, which represents the unbalance of the opponent via a combination of displacement, pulling and pushing actions using the grip on the opponents sleeve and lapel; (b) tsukuri, which represents the technique execution and demands a specific combination of legs, trunk and arms positioning to create leverage to throw the opponent in the most efficient way; (c) kake, which represents the finalization of the technique and is characterized by the end of the throwing process (i.e., the phase when the opponent loses contact with the ground up to the impact on his/her back).

As the judo athletes know the main techniques of their opponents, the contest is based on mutual deceiving to induce the opponent to err and create an opportunity for a successful throwing technique execution [3]. To increase their unpredictability, judo athletes vary their gripping

strategies reaching a more complex pattern when gripping and connecting with a throwing technique [1], attack in different directions and sides [4, 5], using different techniques [3], and creating an individualized system of attacks [5]. However, it has been indicated that judo athletes need to be able to attack in at least three different directions/sides (e.g., right forward, left forward, left backward) to increase their unpredictability. Specifically, attacking in one or two directions/sides would allow an easier defensive action of the opponent as well as allowing him/her to create a strategy to avoid such attacks via displacements in the opposite line of directions/sides. Conversely, when the athlete is able to attack in three or more directions/sides it is harder to predict the specific combinations that can be used [3, 4].

Despite the relevancy of direction and side of attacks for successful judo throwing technique execution, few studies were published about this aspect [3–5]. Understanding the characteristics of successful throwing techniques execution by high-level judo athletes can be useful to improve the system of attacks of judo athletes in preparation to reach international level, as well as to provide indications concerning the postural regulation training to avoid such throwing techniques [3]. Moreover, no study analysed if judo athletes have varied the direction and side of attacks when two successful throwing techniques resulted in score in a single match. Thus, the main goals of the present study were to describe the direction and side of attacks of judo athletes competing at the World Championship level, to compare the distribution of direction and side of attacks between sexes, weight categories and competition phases, and to verify if there was a variation in the direction and side of two successive scoring attacks in the same match. The main hypotheses of the present study were that no differences would be found between sexes, weight categories, and competition phases concerning the direction and side of attacks, but that successive scoring attacks executed in the same match would be performed in different directions or sides.

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Methods

Sample

The present study analysed single 771 scoring actions performed during the 2017 Judo World Championships for all weight categories and sexes. Additionally, a total of 126 double scoring actions were considered. The present study was approved by the local ethics committee (62743516.7.0000.5391).

Direction and side of judo's technique execution analysis

For each scoring technique, the direction of attack was determined considering the uke (athlete being attacked) as reference and divided in four directions [3]: backwards right, backwards left, forward right, forward left. A total of 771 scoring actions derived from scoring throwing techniques were analysed.

In the matches where one athlete scored twice ($n = 126$), we determined if the second scoring action was performed exactly in the same direction of the first one, if it occurred in the opposite sense, or if it was executed preserving one component of the first technique (e.g., backwards or forwards, right or left). Thus, four possibilities were determined: same side and direction, same side and different direction, different side and same direction, different side and direction.

These actions were determined for each sex (male and female), for each weight category (all seven weight categories) and considering the competition phases (eliminatory and repechage here denominated as no-medal phase, versus bronze medal, semi-final and final matches, here denominated as medal phase).

Statistics

Data were analysed using Statistica for Windows (Statsoft, version 8, Tulsa, OK, USA). Frequency and percentage were used to present the distribution for the variables (direction of scoring actions and similarity of scoring actions concerning direction and side). Differences between sex, weight category and phase of competition with direction of scoring actions and similarity of scoring actions were analysed using Chi-square. Significance level was set at 5%.

Table 1 Direction and side of scoring throwing techniques during the female and male contests in the 2017 Senior Judo World Championship

	Female, <i>n</i> (%)	Male, <i>n</i> (%)	Total, <i>n</i> (%)
Forward left	83 (27.9%)	146 (30.9%)	229 (29.7%)
Forward right	81 (27.2%)	129 (27.3%)	210 (27.2%)
Backward left	74 (24.8%)	101 (21.4%)	175 (22.7%)
Backward right	60 (20.1%)	97 (20.5%)	157 (20.4%)
Total	298 (100%)	473 (100%)	771 (100%)

Data are presented as frequency and percentage of total

Results

Table 1 presents the number and percentage of techniques that resulted in scores according to the direction and side of the attacks.

No difference in the direction and side of scoring techniques distribution was found between males and females ($\chi^2 = 1.55$, $df = 3$, $p = 0.671$). Thus, the seven weight categories were grouped for the two sexes to verify the difference in the distribution between this factor and the direction and side of the scoring techniques (Table 2). There was no difference in the distribution of direction and side of scoring techniques between the weight categories ($\chi^2 = 25.43$, $df = 18$, $p = 0.113$).

Table 3 presents the number and percentage of scoring techniques according to the direction and side of attacks in the different phases of the competition. There was also no difference in the distribution of the direction and side of scoring techniques between the competition phases ($\chi^2 = 7.04$, $df = 3$, $p = 0.071$).

Table 4 presents the number and percentage of the scoring techniques executed for the same side and direction in when successive scoring techniques were performed in the same match.

No difference in the distribution of the successive scoring techniques performed for the same side and direction in the same match was found between males and females ($\chi^2 = 2.43$, $df = 3$, $p = 0.488$). Thus, the seven weight categories were grouped for the two sexes to verify the differences between this factor and the successive scoring techniques executed for the same side and direction in the same match (Table 5).

There was no difference in the distribution of the successive scoring techniques performed for the same side and direction in the same match between the weight categories ($\chi^2 = 11.92$, $df = 18$, $p = 0.851$). Additionally, there was also no difference concerning the distribution of the successive scoring techniques performed for the same side

Table 2 Direction and side of scoring throwing techniques during contests in each weight category in the 2017 Senior Judo World Championship

	Extra-lightweight, n (%)	Half-lightweight, n (%)	Lightweight, n (%)	Half-middleweight, n (%)	Middleweight, n (%)	Half-heavyweight, n (%)	Heavyweight, n (%)	Total, (%)
Forward left	22 (25.3%)	38 (34.5%)	38 (27.5%)	41 (34.7%)	40 (28.6%)	28 (26.2%)	22 (31.0%)	229 (29.7%)
Forward right	20 (23.0%)	35 (31.8%)	38 (27.5%)	22 (18.6%)	44 (31.4%)	28 (26.2%)	23 (32.4%)	210 (27.2%)
Backward left	30 (34.5%)	21 (19.1%)	36 (26.1%)	25 (21.2%)	22 (15.7%)	27 (25.2%)	14 (19.7%)	175 (22.7%)
Backward right	15 (17.2%)	16 (14.5%)	26 (18.1%)	30 (25.4%)	34 (24.3%)	24 (22.4%)	12 (16.9%)	157 (20.4%)
Total	87 (100%)	110 (100%)	138 (100%)	118 (100%)	140 (100%)	107 (100%)	71 (100%)	771 (100%)

Data are presented as frequency and percentage of total

Table 3 Direction and side of scoring throwing techniques during the different phases of the 2017 Senior Judo World Championship

	No-medal phase, n (%)	Medal phase, n (%)	Total, n (%)
Forward left	209 (30.8%)	20 (21.7%)	229 (29.7%)
Forward right	188 (27.7%)	22 (23.9%)	210 (27.2%)
Backward left	152 (22.4%)	23 (25.0%)	175 (22.7%)
Backward right	130 (19.1%)	27 (29.3%)	157 (20.4%)
Total	701 (100%)	70 (100%)	771 (100%)

Data are presented as frequency and percentage of total

Table 4 Successive scoring techniques executed for the same side and direction in the same match for female and male athletes competing at the 2017 Senior Judo World Championship

	Female, n (%)	Male, n (%)	Total, n (%)
Same side and direction	17 (37.8%)	30 (37.0%)	47 (37.3%)
Same side	7 (15.6%)	19 (23.5%)	26 (20.6%)
Same direction	13 (28.9%)	15 (18.5%)	28 (22.2%)
Opposite direction and side	8 (17.8%)	17 (21.0%)	25 (19.8%)
Total	45 (100%)	81 (100%)	126 (100%)

Data are presented as frequency and percentage of total

and direction in the same match between the competition phases ($\chi^2 = 0.38$, $df = 3$, $p = 0.944$; Table 6).

Discussion

The first hypothesis of the present study, which was that there would be no differences between the sexes, weight categories, and competition phases concerning the direction and side of successful attacks, was confirmed, i.e., no differences between these factors and the direction and side of scoring throwing techniques were revealed. However, the hypothesis that successive scoring attacks executed in the same match would be performed in different directions or sides was not confirmed, as no differences between sex,

Table 5 Successive scoring techniques executed for the same side and direction in the same match for the weight category in the 2017 Senior Judo World Championship

	Extra-lightweight, n (%)	Half-lightweight, n (%)	Lightweight, n (%)	Half-middleweight, n (%)	Middleweight, n (%)	Half-heavyweight, n (%)	Heavyweight, n (%)	Total, n (%)
Same side and direction	6 (35.3%)	5 (50.0%)	9 (39.1%)	9 (40.9%)	9 (39.1%)	6 (31.6%)	3 (25.0%)	47 (37.3%)
Same side	3 (17.6%)	1 (10.0%)	4 (17.4%)	5 (22.7%)	7 (30.4%)	5 (26.3%)	1 (8.3%)	26 (20.6%)
Same direction	5 (29.4%)	2 (20.0%)	6 (26.1%)	2 (9.1%)	5 (21.7%)	5 (26.3%)	3 (25.0%)	28 (22.2%)
Opposite direction and side	3 (17.6%)	2 (20.0%)	4 (17.4%)	6 (27.3%)	2 (8.7%)	3 (15.8%)	5 (41.7%)	25 (19.8%)
Total	17 (100%)	10 (100%)	23 (100%)	22 (100%)	23 (100%)	19 (100%)	12 (100%)	126 (100%)

Data are presented as frequency and percentage of total

Table 6 Successive scoring techniques executed for the same side and direction in the same match during different phases of the 2017 Senior Judo World Championship

	No-medal phase, <i>n</i> (%)	Medal phase, <i>n</i> (%)	Total, <i>n</i> (%)
Same side and direction	43 (37.7%)	4 (33.3%)	47 (37.3%)
Same side	24 (21.1%)	2 (16.7%)	26 (20.6%)
Same direction	25 (21.9%)	3 (25.0%)	28 (22.2%)
Opposite direction and side	22 (19.3%)	3 (25.0%)	25 (19.8%)
Total	114 (100%)	12 (100%)	126 (100%)

Data are presented as frequency and percentage of total

weight category and competition phase and the direction and side of the second scoring action were found.

As high-level athletes attack at least in three different directions/sides to become less predictable [3, 4], and our sample was constituted by international-level athletes, a similar percentage of scoring throwing techniques for the four categories analysed was expected. It is important to emphasize that this did not vary across the sexes, weight categories or competition phases. Especially concerning the competition phases, it is important to recognize that even when the best judo athletes competed in the medal phase, they were still able to perform attacks in different directions and sides without significant differences concerning the no-medal phase. Additionally, we did not analyse the variation across the competition for medal winners to verify if the variation observed in previous studies [3–5] occurred within the World Championship, an information that could add relevant evidence regarding the profile of these athletes.

To increase unpredictability, it was expected that the second scoring throwing technique would be performed to a different side or direction in relation to the first scoring action because this would indicate a variation in attacks within the same match. However, the distribution was similar across the different combinations of direction and side for both sexes, different weight categories and competition phases. This can be explained by the fact that many different techniques can be executed for a similar direction or side and still be different from the first technique. However, the type of techniques was not analysed in the present study. Another possibility is that, between the two scoring techniques, the judo athletes have attacked in other directions to provide the opponent an erroneous information (e.g., when feinting) and then succeed with an attack in the same direction as in the first occasion. However, this should be confirmed in future studies.

Conclusion

This study indicated that there were no differences between the sexes, weight categories, and competition phases concerning the direction and side of successful attacks during a high-level judo competition. Moreover, successive scoring

attacks executed in the same match did not vary concerning the directions or sides of execution.

Author contributions EF, MC and MYT contributed to the conception and design of the study. RGC, GMG, and RLR collected the data and conducted the video-analysis. EF and MY conducted the statistical analysis. All authors contributed for the article writing and approved the final version to be submitted.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest relating to the publication of this manuscript.

Ethical approval This research was approved by the local research ethics committee (62743516.7.0000.5391). This study was conducted in accordance with the 1964 Declaration of Helsinki and its 2013 amendment.

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