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Dynamics of judo contests performed by finalists of European Championships (Rotterdam 2005)

Authors' contributions:
A Study design
B Data collection
C Statistical analysis
D Data interpretation
E Literature search
F Manuscript preparation
G Funds collection

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Summary

Study aim: To analyse struggle dynamics of the best European judoists (male and female). It was assumed that finalists of top-rank European tournaments demonstrated supreme skills.

Material/methods: The analysis included 14 final contests, male and female (7 each) from European Championships in Rotterdam 2005. The following indices of struggle dynamics were determined: of offensive/defensive activity (AI), of effective offensive actions (EA), of effective counterattacks (EC), of effective actions without counterattacks (ED), and global index of struggle dynamics (SDI).

Results: The gold medallists exhibited a markedly higher struggle dynamics in mean EA, EC and SDI values than their opponents. Otherwise, no significant differences were noted between male and female athletes or between weight categories.

Conclusions: Changes in the rules of judo contest should aim at increasing struggle dynamics. Besides, training of tactical skills should focus on fastest gaining a point advantage (by throw or holding, or by making the competitor break rules), as well as on effective defensive actions and on making use of opponent's potential mistakes in the situation of own advantage.

Key words: **Struggle dynamics • Judo • Combat sports**

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Introduction

The basic criterion of assessing a coach are the results of his/her trainees. The training process ought to include not only a physical but also mental, technical and tactical preparations. The world elite competitors are very much alike throughout the top-rank competitions regarding their motor features [1, 4, 12], somatic build [11, 13] and psycho-emotional resistance [3], the latter one, together with technical and tactical skills, is the key factor in achieving success. The majority of studies on the efficiency of combat sports athletes focused on the frequency of using specific means (for example throws, strangles and heaves). Based on the results of those studies, young judo adepts were taught those throws, most often performed by their seniors [2, 5, 6, 14, 15]. In combat sports, however, the action of a competitor is determined by the opponent's counteraction. A technique can be successful with one opponent but not with another. The efficiencies of specific techniques and methods can be determined *post factum* only and related to the contest outcome. Such an analysis of struggle dynamics, based on video-recording, was designed by Kalina [7, 8]. That method is used in all combat sports and martial arts. It enables comparing specific contests in various sports based on a direct clash and, furthermore, may explain the attractiveness of a sport spectacle presented by media. Combat sports and martial arts galas are in their renaissance now, but the Olympic sports like wrestling, judo or fencing, are low in popularity. Kalina's method enables also following the changes within given sport throughout the years, as well as the effects of changes in the rules on struggle dynamics.

The aim of the study was to analyse struggle dynamics of the best European judoists (male and female). It was assumed that finalists of top-rank European tournaments demonstrated supreme skills.

Material and methods

The analysis was based on 14 final contests in male and female tournaments (7 each) at the European Championships in Rotterdam (2005). These contests were selected on assumption that finalists of top-rank European tournaments demonstrated supreme skills.

According to Kalina [7, 8], measuring struggle dynamics is based on the following principles:

1. Every contest is divided into 10-s intervals for recording all activities of the competitors. This enables comparing contests, whether completed in time, ahead-of-time, or prolonged;
2. The ratio of the number of effective events to all events in given category is the measure of that struggle component (category);
3. The average value of all components of given contest is the global index of struggle dynamics (SDI);
4. The events (occurring in 10-s sequences) are recorded symbolically or by a concise description.

The following indices of struggle dynamics were used:

- **Offensive and defensive activity** (offensive/defensive activity index – **IA**), which is the ratio of the number of 10-s contest with at least one action undertaken (attack, counterattack or defence without counterattack) to the total number of sequences;
- **Offensive activity** (index of effective offensive actions – **EA),** which is the ratio of the number of scored attacks to the total number of offensive actions;
- **Counterattacks** (index of effective counterattacks – **EC**), which is the ratio of the number of scored counterattacks to the total number of counterattacks undertaken;
- **Defensive activity without counterattacks** (index of effective actions without counterattacks – **ED**), which is the ratio of the number of effective defences (without counterattacks) to the total number of offensive actions undertaken by the opponent without those responded by counterattacks;
- **Global index of struggle dynamics** (**SDI**), which is the mean value of those specific indices mentioned above.

It is to be remembered that many a time judo contest is finished ahead-of-time and none of the sides is able to undertake counterattack, especially when the settlement comes out in a few seconds from the beginning of the contest. The descriptive events include:

- Specific means of the contest (e.g. *seoi nage* in judo),
- Attacks preceded by feint and its kind,
- Points scored by given contestant,
- Actual result of given contest sequence,
- Contest method used in given sequence or throughout several sequences,

- Punishments applied and kinds of infringements,
- Injuries and their causes,
- Other random incidents, e.g. duration of prolonged intermissions,
- Final result of the contest ([7] p.73).

Such a detailed analysis is not possible in direct observation. Some sequences, or even each action, ought to be analysed several times to come to right conclusions and to accomplish proper records. It is possible thanks to *post-hoc* recording contest's using video or DVD. The observations (competitor's activities, points scored, contest result and other random incidents) should be recorded on special sheets.

In this study the recordings of 14 gold medal contests from European Championship were used; 28 finalists represented 16 nations, most of them from Russia, France and Great Britain (three each). Among the competitors were 8 Olympic medallists and 11 World Championships medallists. Some of them were holders of several of medals and only 6 judoists gained in Rotterdam their first medals from a top-rank competition. Data on the competitors are presented in Table 1.

Results

The finalists of European Championships exhibited a generally low efficiency index (AI = 0.41). This means that in 59% of time the competitors undertook no actions to gain points but only used the preparatory actions, e.g. fighting for a grip or marking attacks.

The efficiency of offensive actions (EA) was also low (0.12). Out of 150 attacks undertaken, only 18 resulted in gaining points and only some of them proved counteractive. The counterattack efficiency index (EC) was equal to 0.32. The efficiency of defensive actions, however, was very high (ED = 0.92). The overall dynamics (SDI) for the 2005 European Championship amounted to 0.47.

The winners of the final contests exceeded their rivals in general struggle dynamics (SDI of the champions was 0.53 and of vice-champions 0.41). They attacked more often, and 21% of those attacks was effective (EA of losers = 0.02). Te efficiency of counterattacks was very high, 66% of them being successful. The world champions also showed a higher defensive efficiency than the vice-champions (ED = 0.98 and 0.82, respectively; see Fig. 1).

The general struggle dynamics index (SDI) for male and female finalists was alike (0.48 and 0.47, respectively). Women, however, had a slightly lower efficiency of counterattacks (ED) than men (0.84 and 0.94, respectively; $p<0.07$). It may suggest that the defensive style is preferred by male judoists (Fig. 2).

Mean values of struggle dynamics indices in various weight categories are presented in Fig. 3. Except

Table 1. Female finalists of European Championships (Rotterdam 2005) [16,17].

Initials	Age [years]	Nation	Weight category [kg]	Best achievements
A.D.	24	Romania	48	I EC (Bucharest 2004, Rotterdam 2005)
F.J.	31	France	48	II OG (Athens 2004)
I.H.	29	Belgium	52	III OG (Athens 2004)
I.A-D.	31	Romania	52	I EC (Bucharest 2004)
O.S.	26	Russia	57	I EC (Rotterdam 2005)
S.C.	25	Great Britain	57	II EC (Bucharest 2004, Rotterdam 2005)
E.W.	28	Nederland	63	I EC (Rotterdam 2005)
C.H.	24	Austria	63	II OG (Athens 2004)
E.B.	26	Nederland	70	II OG (Athens 2004)
Y.S.	31	Italy	70	III OG (Sydney 2000, Atlanta 1996)
R.W.	30	Great Britain	78	II EC (Rotterdam 2005)
C.L.	30	France	78	II OG (Sydney 2000)
K.B.	27	Great Britain	+78	I EC (Rotterdam 2005, Düsseldorf 2003, Wrocław 2000, Oviedo 1998)
T.D.	30	Russia	+78	III OG (Athens 2004)

Table 2. Male finalists of European Championships (Rotterdam 2005) [16,17].

Initials	Age [years]	Nation	Weight category [kg]	Best achievements
A.N.	23	Armenia	60	I EC (Rotterdam 2005)
L.P.	24	Austria	60	I EC (Bucharest 2004)
E.I.	24	Azerbaijan	66	I EC (Wrocław 2000, Paris 2001, Rotterdam 2005)
M.U.	25	Hungary	66	I EC (Maribor 2002)
A.B.	27	Hungary	73	I EC (Rotterdam 2005)
Y.R.	25	Israel	73	II EC (Bucharest 2004, Rotterdam 2005)
O.B.	26	Germany	81	I EC (Rotterdam 2005)
B.N.	29	Slovakia	81	II EC (Rotterdam 2005)
D.A.	28	Spain	90	I EC (Rotterdam 2005)
R.M.	25	Italy	90	II EC (Rotterdam 2005)
C.H.	26	France	100	I EC (Rotterdam 2005)
A.Z.	28	Israel	100	III OG (Athens 2004)
A.M.	26	Russia	+100	I WC (Birmingham 1999, Munich 2001)
J.W.	25	Poland	+100	II EC (Rotterdam 2005)

Legend: EC – European Championships; WC – World Championships; OG – Olympic Games.

for the efficiency of counterattacks (ED), which tended to be lower ($p<0.06$) in athletes from the heavy weight category (above 77 kg for women and above 99 kg for men), no significant differences between weight categories were found for other indices.

The judges scored the competitors 48 points, most of them (56%) being statutory penalties. In 9 of 14 contests, those who gained advantage first, maintained that advantage until the end or won ahead of time by making use of opponent's mistake. One contest ended quickly by 'ippon'. A change in leading was noted only in 4 contests. In total, 28 penalties and 20 technical actions were scored.

Discussion

Although analyses of technical and tactical actions performed by judo contestants were only occasional, several methods were developed for evaluating their efficiency, the numbers of individual throws, holdings, choke holds and levers being studied most frequently. In this way, most popular techniques were determined, which were next implemented in the training schedules of young judoists [2, 5, 6, 14, 15].

The method for measuring struggle dynamics in combat sports, published by Kalina in 2000 [9], can be applied to diverse combat sports and to assess the differences between them. When compared with other

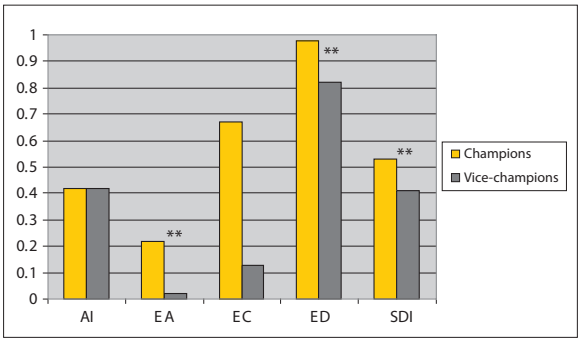

Figure 1. Struggle dynamics indices of gold and silver medallists of the European Championships 2005. ** Significant ($p<0.01$) difference between gold and silver medallists.

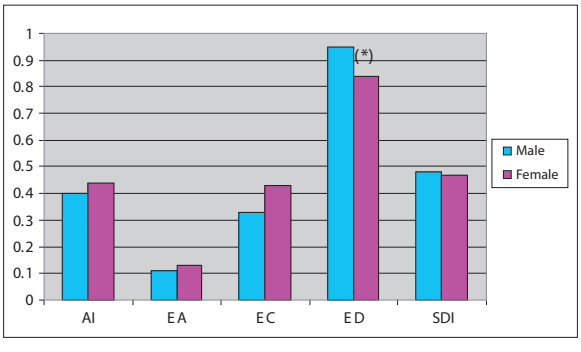

Figure 2. Struggle dynamics indices of male and female finalists of European Championships 2005. (*) Nearly significantly ($p<0.07$) lower from the male judoists.

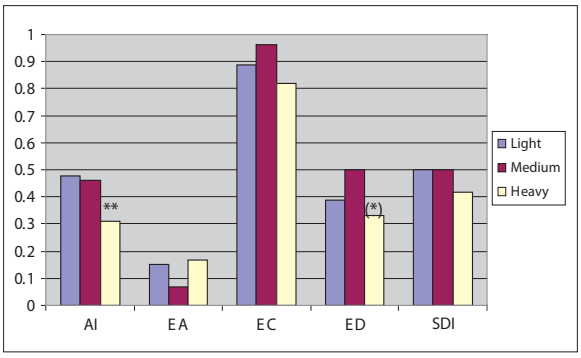

Figure 3. Struggle dynamics indices of male and female finalists of European Championships 2005 in various weight categories. (*) Nearly significantly ($p<0.06$) lower from the medium weight category; ** Significantly ($p<0.01$) lower from the other two weight categories.

combat sports, judo athletes exhibit lowest activity. During the finals in boxing and taekwon-do at Olympic Games (Sydney 2000), the AI values exceeded 0.9, whereas in fencing, in semi-final and final fights at World Championships, they almost always reached 1.0 (which means 100% activity). In the analysed final contests of European Championships in judo, the AI rate amounted to only 0.41. This could be due to too restrictive rules, introduced, ironically enough, in order to increase the activity of contestants, and used to stimulate point advantage by inducing the competitor to break rules. The efficiency of attacks was lowest among taekwon-do athletes (EA=0.017) and judoists (EA=0.12), rare changes of results during the contest being typical of both sports. The contestant who gained advantage first, most frequently won [9,10].

The method used in this study precisely reveals differences between various combat sports, but can be also used for detailed analyses within one sport, taking into account many factors (time, weight category, sex, nationality, etc.). However, it does not take into consideration the specificity of judo referee rulings. The contestant showing 100% defence efficiency loses the contest many a time (without penalty), despite having attained an identical struggle dynamics (SDI) as the winner. Moreover, it is rarely the case that the action of one of the contestant does not come across the competitor's counteraction. Judoists usually show similar activity (AI).

Summing up, records of contests and a detailed analysis of struggle dynamics may prove very useful in preparing training schedules and an opponent-matched contest tactics, especially regarding the current contest status (positive, draw, negative). Moreover, by applying Kalina's method, the influence of combat rules on the choice of methods and means can be demonstrated. The following may thus be recommended:

1. Changes in rules of judo contests should aim at increasing struggle dynamics;

2. Training tactical skills should focus on gaining point advantage (by throw or holding, or by making the competitor break rules) as fast as possible, on effective defensive actions, as well as on making use of opponent's mistakes in a situation of own advantage.

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