ORIGINAL ARTICLE
SCIENCE OF MARTIAL ARTS

Directions of changes in match structure in female wrestling based on World Wrestling Championships 2014 and The Olympic Games 2016 observations

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Manuscript Preparation
E Funds Collection

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Received: 21 November 2019; **Accepted:** 11 December 2019; **Published online:** 20 December 2019

AoBID: 13274

Abstract

Background and Study Aim: In all sport disciplines, the simplest and the most commonly used method of the athlete level evaluation, or theirs progress in sport competition is observation. The aim of study was knowledge about current trends of changes in structure of matches in female wrestling, through similarities and differences identification of technical activities performed during World Wrestling Championships (Tashkent, Uzbekistan 2014) and the Olympic Games (Rio De Janeiro 2016).

Material and Methods: Study included the course of sport competition during World Wrestling Championships 2014, where 92 competitors have participated, and 167 matches were played, and the Olympic Games 2016, where 115 competitors have participated and 112 matches were played. The source material comprised digital record's of matches, which enabled secondary and direct analysis with multiplied repetition and stoppage of recording.

Results: In both tournaments, points score decided about the result of majority of matches. The most commonly technical activities used were takedowns. On this basis, no significant differences were identified in structure of duel's settling, and the most dominant way of victory was winning in regular match time.

Conclusions: The results of our analyses (a small number of fights won before the end of regular time) confirm the principle that endurance preparation is one of important factors determining sport success in women's wrestling. Another crucial determinant of victory is ability of fast reaction to opponent's activities (counterattack), that confirms the high number of takedowns performed by competitors in lower weight categories.

Keywords: combat sports • leg attack • tactics • takedown • technique

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: Departmental sources

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Counterattack – *verb* to make an attacking move from a defensive [28].

Endurance – *noun* the ability or power to bear prolonged exertion, pain or hardship endurance athlete [28].

Leg attack – a move in which a wrestler takes the opponent down by grasping both of the opponent's legs and pulling them.

Load – *noun* **1.** a weight or mass which is supported **2.** the force that a body part or structure is subjected to when it resists externally applied forces **3.** the amount of something, usually weight, that a body part can deal with at one time [28].

Motor skills – *plural noun* the ability of a person to make movements to achieve a goal, with stages including processing the information in the brain, transmitting neural signals and coordinating the relevant muscles to achieve the desired effect [28].

Skill – *noun* an ability to do perform an action well, acquired by training [28].

Sprawl-counterattack – a move used to counter a leg shot. The wrestler throws the legs back and arches the hips into the opponent to break the hold and takedown him.

Tactics – *plural noun* the art of finding and implementing means to achieve immediate or short-term aims [28].

Takedown (in this work also: **throw**) – wrestling techniques that involve lifting the opponent up and throwing or slamming them down.

Technique– *noun* a way of performing an action [28].

Touche – in wrestling word used to indicate that the wrestler is beaten by a « fall ». For a fall, the referee himself says « touche », strikes the mat with his hand, and blows his whistle to indicate the end of the bout [29].

INTRODUCTION

In all sport disciplines, the simplest and the most commonly used method of the athlete level evaluation, or theirs progress in sport competition is observation. On the basis of observation, the analysis can be carried out, conclusions are drawn up technical and tactical skills of athlete are rated [1-3]. Participating in tournaments and competitions is the most proper way to reflect the efficiency of practice and trainings, organization and training methods. Kruszewski at al. [4] draw attention to the fact, that the results and mental attitude are the most important indicators of athlete's value.

Analysis of sport match is an integral part of training process. Tournaments wrestle recording, and further analysis of this material provides information about current tendencies, whereas direct duels with opponent show the progress and mistakes in athlete's training course.

Kruszewski et al. [5] in other article addressed the question of development of wrestling sport, and indicated directions of changes in individual elements of match structure in sport competition. These authors compared wrestler's rivalry during two Olympic Games, which took place in Atlanta (1996) and Beijing (2008). Sport regulations existing during these tournaments were significantly different. The main differences were the duration of matches and points awarded for technical activities by referees. In Atlanta, match included only one round, which was five minutes length, whereas in Beijing, match included three rounds, which were two minutes length each. The change of regulations affected the changes in style and tempo of duel, and most of all, in the match tactics. Characteristic differences were seen in individual weight categories. The settlement of match in horizontal position was characteristic for lower weight categories, while in higher weight categories, the settlement of match was done in standing (vertical) position (Greco-Roman). Authors indicted, that technical and tactical preparation of athlete, should harmonized with development of other motor skills, such as strength, force, speed and flexibility.

The specificity of wrestling match relates to technical and tactical variety at activities in different weight categories, styles of wrestling (Greco-Roman, freestyle), as well as women's wrestling. Athletes should develop both physical and psychological predispositions, because they can affect on overall efficiency. Talent and training process allows to perform proper actions during the match, characteristic for individual athletes. Solid technical preparation decreases the energy expenditure used during the match. Athletes with low technical skills are forced to compensate their deficiencies by realization of enhanced training loads [6]. The highest rank sports tournaments allow to carry out a number of different researches and studies elements of match, providing numerous valuable and important information. Thanks to it, it is possible to determine development trends of tactical solutions, analyse match indicators and seek effective technical activities [7].

The analysis of the highest rank (such as the Olympic Games or World Championships) tournaments test results can help coaches to rationalize training process and increase the likelihood of victory. Properly done analysis of match should cover the way of settling the match, type and number of the most effective technical activities and time needed to perform technical activities, which would allow athlete to triumph. It is advised not to generalize results for all weight categories [7].

Specificity of activities in wrestling match and interaction between athletes, affects the match tactic. That consists of simple and complex movement operations. Actions performed by opponent during the match, complicate performing the athlete's action and enforce them to connect activities and create different combinations. During long-time trainings and courses, wrestlers assimilate their favourite techniques, and better training increases possibilities to conduct the match in diverse way and increases the chance of victory [5, 8].

The top-ranked athletes, who have mastered technique well and know how to use it effectively, are a role models when they are able to adapt it to matches with various opponents. Before the match, athlete should think over all technical activities, which will be used during the duel and they should consider different technical and tactical solutions. Observation the top-ranked athletes can be helpful in determining types of such models.

Consequently, the aim of study was knowledge about current trends of changes in structure of matches in female wrestling, through similarities

Table 1. Numbers of athletes and matches in respective weight categories during World Wrestling Championships 2014 (WC) and Olympic Games 2016 (OG).

Weight category	Number of athletes		Number of matches	
	WC	OG	WC	OG
–48 kg	20	18	38	22
–53 kg	18	22	34	23
–58 kg	14	20	27	24
–63 kg	15	19	25	22
–69 kg	11	18	18	22
75 kg	14	18	25	21

and differences identification of technical activities performed during World Wrestling Championships (Tashkent, Uzbekistan 2014) and the Olympic Games (Rio De Janeiro 2016).

MATERIAL AND METHODS

Study included the course of sport competition during World Wrestling Championships (WC) 2014 (Uzbekistan), where 92 competitors have participated, and 167 matches were played (n = 167 matches), along with the Olympic Games (OG) 2016, where 115 competitors have participated and 112 matches were played (n = 112 matches). The source material comprised digital records of matches. Number of athletes (competitors) in different weight categories and number of matches got are presented in Table 1.

The method used in observation was secondary and direct analysis. Digital records allowed multiplied repetition and stopping, which is crucial in making detailed technical activities analysis performed during the match.

During the observations data analysis were obtained. They concerned belonging to respective weight categories, scored technical activities and positions, in which technical activities were performed and the final record of match.

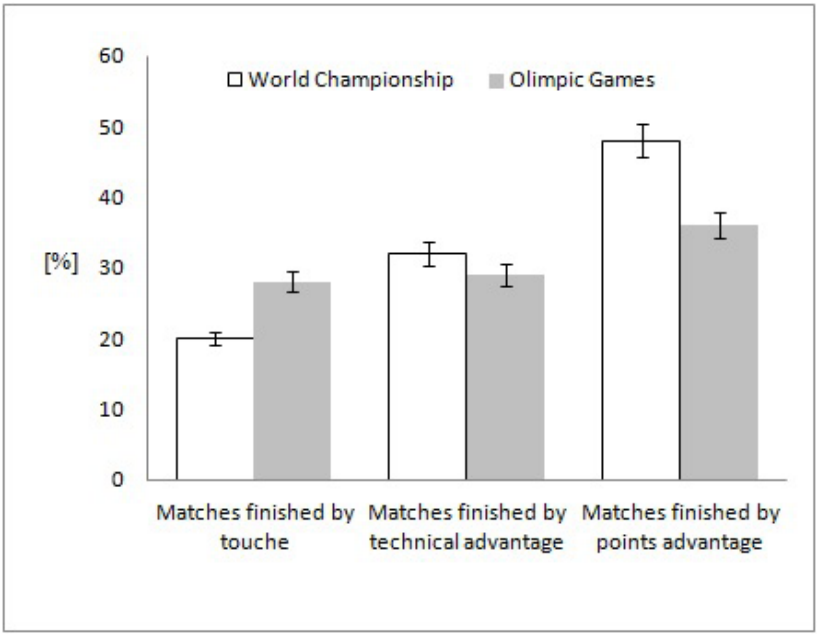

Figure 1. Summary of finishing ways of the matches.

Statistical analysis

Data were processed using IBM SPSS statistical software® ver. 22.0 for Windows (New York, USA). Descriptive, combat resolution structures are presented as mean and standard deviation (±). For categorical data, results were expressed as absolute numbers (n) and percentages (%). Chi-square analysis was used to investigate the relationship between the type of victory method and variables of interest, such as weight categories. One-way analysis of variance repeated measurements Friedman's rank (Friedman's ANOVA) was used to comparison of the average number of points scored in individual weight categories (1 point, 2 points, 4 points) by the nonparametric Wilcoxon pair order test consider to Bonferroni method for post-hoc correction. Significance was set a priori at $p \leq 0.05$.

RESULTS

Differences between WC and OG were statistically irrelevant for all ways of finishing the match ($p > 0.05$). At both levels of sport rivalry (World Wrestling Championship 2014 and Olympic Games 2016) the dominant way of winning was points advantage (Figure 1). Differences between victory by points advantage and other were statistically relevant ($p \leq 0.05$). During World Wrestling Championships 2014, 32 matches (20%) were finished by touche (before the end of regular combat time) and during the Olympic Games 2016, 38 matches (29%) were finished by in such way. During World Wrestling Championships 2014, 81 matches (48%) were victory by points advantage, whereas in Rio De Janeiro 2016, 53 matches (39%) were finished in that way (Figure 1, Table 2).

Differences between legs attack and throws, sprawl and throws were statistically relevant ($p \leq 0.05$). The average frequency of wrestlers' activity during World Wrestling Championships 2014 was higher than the Olympic Games 2016 subset (Table 3).

Differences between World Championships and the Olympic Games were statistically irrelevant for selected technical activities. Athletes the most frequently used leg-attacked in −58 kg weight categories during WC (3.35 average per match) and during OG = 2.9; sprawl in −63kg: WC = 3.33 and OG = 3.1; while throws in 75 kg: WC = 2.4 and OG = 2.2 (Table 4).

Table 2. Proportions (%) of way of victory the wrestling matches during World Wrestling Championship 2014 and Olympic Game 2016 in respective female weight categories.

Weight category	Level sports competition	Way of victory by:		
		touche	technical advantage	points advantage
−48 kg	WC	6.02	5.26	**21.05***
	OG	3.01	3.76	**19.02***
−53 kg	WC	3.61	**16.54***	4.51
	OG	2.26	3.01	**12.03***
−58 kg	WC	2.41	6.77	**10.53***
	OG	3.76	3.76	**10.53***
−63 kg	WC	3.01	3.01	**12.03***
	OG	2.26	4.51	9.77
−69 kg	WC	2.41	2.26	8.27
	OG	1.50	3.76	3.76
75 kg	WC	3.61	3.01	**11.28***
	OG	6.02	3.01	6.77

*p≤0.05

Table 3. Average number of selected technical activities performed during the match.

Level sports competition	Legs attack	Sprawl	Throws
WC	2.6	2.8	**1.4***
OG	2.4	2.5	**1.2***

*p≤0.05

Table 4. Selected technical activities during wrestling matches in respective female weight categories.

Weight category	Legs attack				Sprawl				Throws			
	WC		OG		WC		OG		WC		OG	
−48 kg	2.8	±4.71	2.5	±3.88	3.2	±7.5	2.8	±6.9	1.2	±3.8	0.97	±3.4
−53 kg	2.1	±3.89	1.7	±3.62	2.34	±4.1	2.2	±3.99	0.7	±2.9	0.5	±2.6
−58 kg	**3.35**	±6.21	**2.9**	±5.59	2.6	±5.2	2.1	±3.8	0.6	±2.7	0.5	±2.4
−63 kg	2.34	±3.39	2.1	±3.1	**3.33**	±4.2	**3.1**	±3.89	1.4	±3.7	1.2	±3.2
−69 kg	2.25	±4.1	1.9	±3.7	2.31	±4.5	2.19	±3.87	2.1	±4.8	2	±4.2
75 kg	1.94	±1.72	1.69	±1.63	0.11	±2.82	0.15	±2.45	**2.4**	±5.6	**2.2**	±5. 2

Lack of statistical relevancy of differences between selected technical activities (Figure 2). Differences between World Wrestling Championships 2014 and the Olympic Games 2016 were statistically irrelevant for selected technical activities. Differences between activities for 2 points and activities for 1 point and 4 points were statistically relevant (p≤0.05) in all weight categories , while differences between activities for 2 points and activities for 1 point and 4 points were statistically relevant (p≤0.01) in weight categories: −58kg during WC; −63kg during WC and OG; −69kg during WC (Table 5).

DISCUSSION

The way of achieving victory in wrestling match is one of the elements of evaluation athlete's preparation to duel. It is important to indicate, that

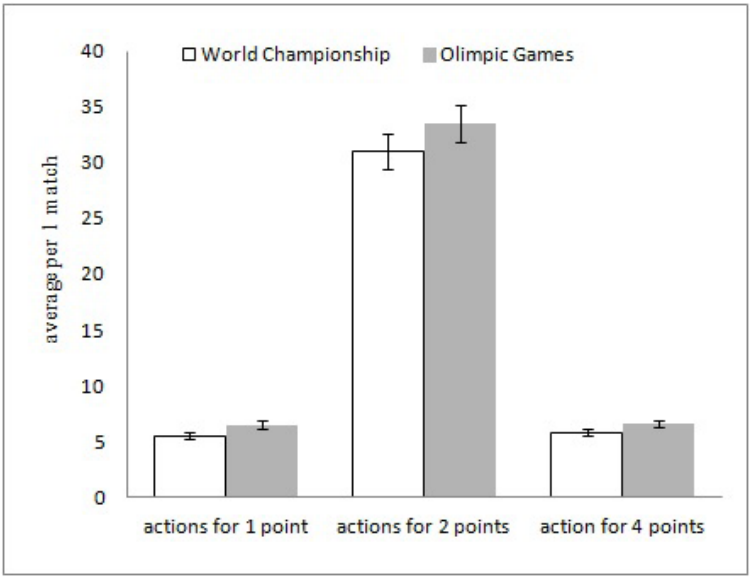

Figure 2. Summary of average number of technical activates for 1-, 2- and 4 points during World Wrestling Championships 2014 and the Olympic Games 2016.

Table 5. Summary of average number of technical activities for 1 point, 2 points and 4 points in respective weight categories.

Weight category	Level sports competition	Evaluation of technical activity		
		for 1 point	for 2 points	for 4 points
−48kg	WC	0.7	**5.6***	1.1
	OG	0.5	**5.1***	0.8
−53kg	WC	0.7	**5.6***	1.1
	OG	0.6	**5.5***	1
−58kg	WC	0.5	**7.1****	1.2
	OG	0.4	**6.7***	1
−63kg	WC	1.5	**7.5****	1.5
	OG	1.2	**7.4****	1.3
−69kg	WC	1.5	**9.1****	1.7
	OG	1.3	**8.8***	1.4
75kg	WC	0.8	**5.7***	2.2
	OG	0.7	**5.5***	2.1

*Differences between activities for 2 points and activities for 1 point and 4 points were statistically relevant ($p \leq 0.05$);
**Differences between activities for 2 points and activities for 1 point and 4 points were statistically relevant ($p \leq 0.01$).

high variety of athletes in terms of technical and tactical preparation causes increase in number of matches finished by touche (before the end of regular combat times). During World Wrestling Championships 2014, 32 matches were finished in such way (20% of matches), and during the Olympic Games 2016, 38 matches were finished by touche (29% of matches). Results of our study are consistent with Tunnemman's and Carby [7] observation, because the difference was not statistically significant.

Wrestling bout is divided into two, three-minute rounds. If none of athletes finish the bout by touch, then the one with higher technical score wins (victory by points advantage). During World Wrestling Championships 2014, 81 matches were finished in that way (48% of matches), whereas in Rio De Janeiro 2016, 53 matches were finished in that way (39% of matches). High number of matches finished in regular time, as a result of advantage obtained by one of athletes, may indicate more and more balanced sport preparation level of top-ranked athletes. Studies by Kruszewski et al. [5, 8], Tunnemman [9] and Miarka [10] seems to confirm this thesis.

This tendency can also be noted in other combat sports disciplines. In his study, Boguszewski [11] analysed the structure of finishing the match in judo. The study included from 2005 to 2008. The conclusion indicates balanced sports level of preparation. This tendency causes that besides the optimal technical level, athletes have to distinguish themselves from their contestants by superior physical preparation [12].

Increase in number of victories gained during the regular match time, results in excellent endurance preparation need. Links between ability to perform anaerobic exertions and sports results are confirmed by studies done by Hubner-Woźniak et al. [13], Garcia-Pallares et al. [14, 15], indicating increased ability to perform exertions of short duration and high intensity, as a determiner of sport success.

On the other hand, endurance and strength nature abilities are dominant in group of physical conditioning predispositions, according to researches done by Gierczuk and Ljach [16], Nikooie et al. [17] and Vattinen [18]. At the same time, it should be also noted that body weight reduction, closely linked to sport competition in wrestling, can essentially affect maintaining the endurance and anaerobic efficiency, resulting in decrease of these predispositions [19, 20].

Furthermore, it is important to point out, that structure of women's wrestling training becomes more and more similar to men's

wrestling training structure [21]. In pursuance of winning the wrestling match, wrestlers perform various technical activities. In generally accepted division, we can distinguish use of offensive and defensive activities. Offensive activities include "legs attack" and "throws" whereas defensive activities include sprawl (counterattack) takedown.

Both action groups have been reflected in analysed tournaments. Number of offensive activities – legs attack – and defensive sprawl takedowns were close to each other in both tournaments (insignificant difference). Similar dependences indicating wrestlers starting efficiency, depending on their fast reaction, have been confirmed by other studies [22, 23]. During the wrestling match, athletes are compelled to react quickly to opponent's activities, essentially by proper identification of them, and selecting appropriate response to them [24].

High numerical values of defensive activities, obtained in our studies, indicate applicability of two types fast reaction – simple and complex. The fact of performing touchdown as a counterattack seems to confirm this thesis. Multiple researches points out significant correlation between obtained sport results and time of simple and complex reaction [25-27]. However, he notes, that the dependency in relation to simple reaction is significantly higher for male and female wrestlers in lower weight categories whereas, in relation to complex reaction among male and female wrestlers in higher weight categories. Similar observations can be found in studies carried by Tunnemann [19] during Cadet World Championships.

Our research seems to confirm this thesis, because high number of defensive activities sprawl takedown concern mainly lower weight categories (for example –48 kg), while high number of offensive activities throws concern mainly higher weight categories) (for example 75 kg).

CONCLUSIONS

The results of our analyses (a small number of fights won before the end of regular time) confirm the principle that endurance preparation is one of important factors, determining sports success in women's wrestling.

One of the most important factor, determining sports success in women's wrestling is the ability to quick reactions to opponent's actions. This thesis is confirmed by high number of technical activities performed during the counterattack (take downs), by wrestlers in lower weight categories.

In training course for lower weight categories, the importance of perfecting leg-attack activities should be noted (53 kg weight category WC =2.1; 53 kg OG = 1.7 average per match). However, in higher weight categories, throws and technical activities related to counterattack should be mastered, which will allow to perform takedown to horizontal position.

REFERENCES

1. Franchini E, Takito MY, Bertuzzi RCM. Morphological, physiological and technical variables in high-level college judoists. Arch Budo 2005; 1: 1-7
2. Gorelov AA, Nikitin SN, Suschenko VP et al. Origins and development of Yakut national wrestling hapsagay in domestic combat sports. Theor Prac Phys Cult 2015; 3: 53-56
3. Pujszo R, Marek A, Wolska B. The course of judo competition created by gold medallists of the World Championships 2015 in Astana. Arch Budo Sci Martial Art Extreme Sport 2017; 13: 119-125
4. Kruszewski M, Kruszewski A, Kuźmicki S et al. Boxing techniques based on the analysis of boxing tournament finals during Olympic Games in London in 2012. J Combat Sports Martial Arts 2016; 7(1): 61-66
5. Kruszewski A, Kruszewski M, Kuźmicki S et al. Directions of technical and tactical changes of free style wrestlers in the twelve-year period of 1996-2008. J Combat Sports Martial Arts 2011; 1(2) 56-78
6. Kruszewski A. Zapasy styl wolny, podstawy techniki. Warszawa: Akademia Wychowania Fizycznego; 2008 [in Polish]
7. Tunnemann H, Curby D. Scoring Analysis of the Wrestling from the 2016 Rio Olympic Games. Int J Wrestling Sci 2016; 6: 90-116
8. Kruszewski A, Jagiełło W, Kucharska E. Characteristics of technical and tactical activities of wrestlers in the Olympic tournament in Beijing 2008. Sport Wyczynowy 2009; 3: 35-41 [in Polish]
9. Tunnemann H. Scoring analysis of the 2011 World Championship in Free Style Wrestling. Int J Wrestling Sci 2011; 1: 67-83
10. Miarka B. Demandas tecnico-tactiacas e fisiologicas de combates da luta olimpica. Rev Artes Marciales Asiat 2016; 11(1): 18-31 [in Spanish]
11. Boguszewski D. Technical fitness training of judocas – limitations of top world tournaments in the years 2005-2008. J Combat Sports Martial Arts. 2010; 3: 24-32
12. Adolf VA, Sidorov LK, Kudryavtsev MD et al. Precompetitive fitness methods applied by Russian judo teams prior to international events. Theor Prac Phys Cult 2018; 9: 66-68
13. Hübner-Woźniak E, Kosmol A, Lutosławska G et al. Anaerobic performance of arms and

legs in male and female free style wrestlers. J Sci Med Sport 2004; 7(4): 437-480

14. Garcia-Pallarés J, López-Gullón JM, Muriel X et al. Physical fitness factors to predict male Olympic wrestling performance. Eur J Appl Physiol 2011; 111(8):1747-1758
15. Garcia-Pallarés J, López-Gullón JM, Torres-Bonete M et al. Physical fitness factors to predict female Olympic wrestling performance and sex differences. J Strength Cond Res 2012; 26(3):794-803
16. Gierczuk D, Ljach W. Evaluating the coordination of motor abilities In Greco-Roman wrestlers by computer testing. Hum Movement 2012; 13(4): 323-329
17. Nikooie R, Cheraghi M, Mohamadipour F. Physiological determinants of wrestling success in elite Iranian senior and junior Greco-Roman wrestlers. J Sports Med Phys Fitness 2017; 57(3): 219-226
18. Vattinen T. Strength and training profiles of top Greco-Roman wrestlers in Finland. In: Baić M, Drid P, Starosta W, Curby D, Karnincic H, editors. Applicable Research In wrestling. International Scientific and Professional Conference on Wrestling - Applicable Research in Wrestling; 2017 May 5-7; Novi Sad / Zagreb. Novi Sad-Zagreb: Faculty of Sport and Physical Education, University of Novi Sad & Faculty of Kinesiology, University of Zagreb; 2017: 253
19. Horswill CA. Applied physiology of amateur wrestlers. Sport Med 1992; 14: 114-143
20. Vardal SA, Tezel S, Őztürk L et al. The relationship between body composition and anaerobic performance of elite young wrestlers. J Sports Sci Mede 2007; 6: 34-38
21. Silverman IW. Sex differences In Simple Visual reaction time: e historical meta-analysis. Sex roles 2006; 54(1-2): 57-69
22. Mirzaei B, Curby DG, Rahmani-Nia F et al. Physiological profile of Iranian junior freestyle wrestlers. J Strength Cond Res 2011; 23: 2339-2344
23. Gierczuk D, Bujak Z. Reliability and Accora of Batak Lite tests used for coordination motor abilities in wrestlers. Pol J Sport Tour 2014; 21(2): 72-81
24. Trimmel M, Poelzl G. Impact of background noise on re action time and brain DC potential changes of VDT-based spatial attention. Ergonomics 2006; 49(2): 202-209
25. Kruszewski A, Polanowski B. Psycho-motorial preparation of wrestlers in Greco-Roman Style. Pedagog Psychol Med-Biol Probl Phys Train Sport 2006; (5): 48-53
26. Cojocariu A, Abalasei B. Does the reaction time to visual stimuli contribute to performance in judo? Arch Budo 2014; 10: 73-78
27. Gierczuk D. Somatic and physical conditions of sports results of highly qualified wrestlers. Warszawa: Akademia Wychowania Fizycznego; 2019 [in Polish]
28. Dictionary of Sport and Exercise Science. Over 5,000 Terms Clearly Defined. London: A & B Black; 2006
29. United World Wrestling. Basic vocabulary. 2019 [cited 2019 Oct 22]. Available from: https://unitedworldwrestling.org/sites/default/files/media/document/basic_vocabulary.pdf

Cite this article as: Kruszewski A, Kruszewski M, Kuźmicki C et al. Directions of changes in match structure in female wrestling based on World Wrestling Championships 2014 and The Olympic Games 2016 observations. Arch Budo Sci Martial Art Extreme Sport 2019; 15: 45–52