

Fitness profiles of successful and less successful Greco-Roman and freestyle wrestlers

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Abstract:

Identifying success factors (physical, physiological and psychological ones) as well as establishing physical and psychological profiles, wrestling-specific fitness and other elements contributing to wrestling performance would be beneficial to coaches as they would be capable of planning wrestlers' training according to their competitive level, style and weight class. This study sought to develop fitness profiles of successful and less successful wrestlers taking account of their wrestling styles, weight classes and performance in tournaments. The study included 62 male Greco-Roman wrestlers and 66 male freestyle wrestlers. All of the study participants were either successful wrestlers (they won medals in Polish Senior Championships and other major sporting events) or less successful ones (they placed 5th to 8th in the above-mentioned competitions). The following parameters were assessed: dynamic strength, strength endurance, agility, wrestling-specific fitness and special endurance. Fitness profiles of successful and less successful wrestlers proved to be different. The differences were less evident in lightweight competitors. To identify factors determining success (winning a medal), logistic regression was applied. It was shown that differences occurred in heavyweight wrestlers only, and they were noted in agility, wrestling-specific fitness and special endurance. Wrestlers' fitness profiles differ in terms of wrestling styles and weight classes. When it comes to developing motor abilities in wrestlers (regardless of their styles and weight classes), it is necessary to put emphasis on dominant components of physical fitness in the first place. Identification of indices of physical fitness in successful wrestlers (medal winners) may constitute the basis for rationalisation of the training process in wrestling. It ought to be borne in mind when selecting training means oriented at improving dominant components of motor profiles of wrestlers.

Key Words: Wrestling; Motor abilities; Success factors

Introduction

The modern programming of elite athlete training requires current knowledge about the effective motor, technical and psychological conditioning, as well as about its adjustments to particular periods of a training macrocycle [Bompa & Buzzichelli, 2019; Platonov & Nikitenko, 2019]. For a number of years, new training solutions incorporating current trends of sports competition have been sought in various sports, including wrestling. Scientific research focuses, among other things, on age, somatic build, training experience, training means and methods, technical and tactical aspects of the fight, motor abilities or mental capabilities of athletes [Balushka et al., 2020; Bayraktar & Koc, 2017; Marković et al., 2017; Melki et al., 2019; Mirzaei et al., 2017; Nagovitsyn et al., 2018; Nikooie et al., 2017; Rutkowska et al., 2020; Tünnemann, 2017; Tünnemann & Curby, 2016]. All these activities aim to identify factors determining success or failure in wrestling competition. One of the defining characteristics of mastery in wrestling is motor fitness. Many studies point to an association between physical preparation and wrestlers' performance [Bayraktar & Koc, 2017; Cieslinski et al., 2021; García-Pallarés et al., 2011; Gierczuk et al., 2018; Kostovski et al., 2011; Mirzaei et al., 2011]. It is also indicated that wrestlers' physical fitness profiles vary depending on their wrestling styles and sports class [Baić et al., 2007; Bayraktar & Koc, 2017; Damirkan et al., 2014] and that they distinguish medal winners from non-winners. According to some authors, high performance in wrestling is related to strength and endurance [Nikooie et al., 2017; Sterkowicz & Starosta, 2005]. Others give priority to speed, suppleness and agility [Mirzaei et al., 2011], and still others emphasise the role of suppleness as an ability enabling the execution of wrestling techniques, mainly those aimed to bring the opponent down [Baić et al., 2007]. Moreover, some researchers claim that high levels of strength and power should go together with high levels of suppleness [Ackland et al., 2009]. Suppleness is the key component of fitness preparation, which supports technical preparation [Mirzaei et al., 2011] and simultaneously helps to prevent injuries [Hrysomallis, 2011]. On the other hand, these abilities do not go hand in hand in terms of development, and it seems that striking a balance between them is crucial.

The results of the available studies on the characteristics of successful wrestlers are not only diverse but, in many cases, also inconsistent. The main reason for this is the use of different research methods and subject selection approaches by their authors, as well as changes to competitive wrestling rules

[<https://unitedworldwrestling.org>, 2019]. Another problem in this research field is the shortage of studies investigating physical fitness of elite wrestlers [García-Pallarés et al., 2011]. There is also a scarcity of research regarding elite wrestlers who are successful in international competitions including Olympic Games [Mirzaei et al., 2011].

Only a few studies have examined differences in physical fitness in Greco-Roman and freestyle wrestlers using the same tests and the same weight category [Baić et al., 2007; Basar et al., 2014; Bayraktar & Koc, 2017; Damirkan et al., 2014; Lopez-Gullon et al., 2011; Mirzaei et al., 2013]. Surprisingly, a lot of researchers often omitted some important components of sports preparation, e.g. sport-specific skills. It is common knowledge that wrestling-specific fitness and technical wrestling skills are vital in successful wrestlers' profiles [Gierczuk et al., 2020; Cieslinski et al., 2021]. The determination of fitness profiles and identification of fitness-related success factors in wrestling in the context of wrestling styles and weight classes may provide a lot of useful training tips and contribute to the development of more reliable criteria of talent identification. Therefore, it is worth looking for factors that would be common for representatives of the same sport as well as factors differentiating the achievement of successful results with regard to wrestling styles and other determinants.

The aim of the study was to develop fitness profiles of successful and less successful wrestlers taking account of their wrestling styles, weight classes and performance in tournaments.

Materials & Methods

Participants. The study included Greco-Roman wrestlers ($n = 62$) aged 20.95 ± 1.92 and with training experience of 7.90 ± 2.34 years, and freestyle wrestlers ($n = 66$) aged 21.47 ± 2.66 and with training experience of 8.71 ± 2.77 years. The competitors were assigned to one of the two weight classes, i.e. lightweight and heavyweight. In the case of Greco-Roman wrestlers, the first group consisted of athletes from the following weight classes: 59 kg, 66 kg and 75 kg, while the second group was composed of competitors from 85 kg, 98 kg and 130 kg weight classes. As for freestyle wrestlers, the division was similar, i.e. 57 kg, 65 kg and 74 kg (lightweight class) as well as 86 kg, 97 kg and 125 kg (heavyweight class). Afterwards, within those groups, the participants were divided into successful wrestlers (who won medals in Polish Senior Championships and other major sporting events) and less successful ones (who placed 5th to 8th in the above-mentioned competitions). The division was made according to the Polish Wrestling Federation classification [<https://www.zapasy.org.pl>, 2019]. The study was approved by the Senate Ethics Committee for Scientific Research at the University of Physical Education in Warsaw.

Procedure. The study focused on investigating such motor abilities as dynamic strength (standing broad jump - indicator I), strength endurance (pull-ups - indicator II; push-ups - indicator III; wall bar hanging leg raises - indicator IV), agility (zigzag ('envelope') run - indicator V), wrestling-specific fitness (wrestling carousel - indicator VI), standing gymnastic bridge with return - indicator VII) and special endurance (suxplex throws of the mannequin - indicator VIII) [Cieslinski et al., 2021]. Reliability of the tests was $r = 0.63-0.93$ (Pearson's correlation coefficient).

Statistical analyses. The scores were standardised to means and standard deviations. ANOVA was employed to assess intergroup differences. Significance of differences was set at $p < 0.05$. In addition, logistic regression analysis was performed (stepwise regression).

Results

Differences between successful and less successful Greco-Roman lightweight wrestlers were noted in strength endurance (indicators II and III) ($p < 0.01-0.05$) and special endurance (indicator VIII) ($p < 0.05$). Successful and less successful heavyweight wrestlers differed more in comparison to lightweight wrestlers (Fig. 1). The differences were observed in strength endurance (indicators II, III and IV), agility (indicator V) and special endurance (indicator VIII) ($p < 0.05$).

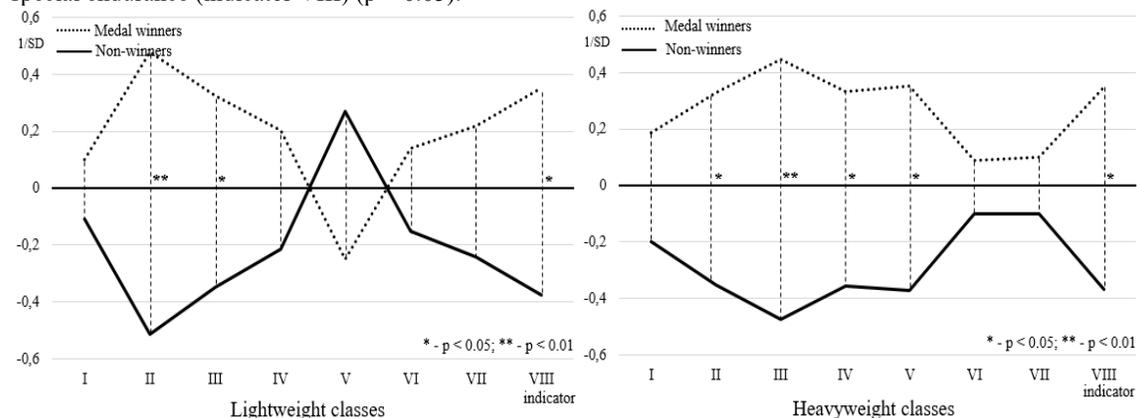


Figure 1. Fitness profiles of successful and less successful Greco-Roman wrestlers (normalised to the whole group).

As for successful and less successful freestyle lightweight wrestlers, differences were only noted in wrestling-specific fitness (indicator VI) ($p < 0.05$). On the other hand, their successful and less successful heavyweight counterparts differed in strength endurance (indicators II, III and IV) ($p < 0.01-0.001$), special endurance ($p < 0.001$) and dynamic strength ($p < 0.05$) (Fig. 2).

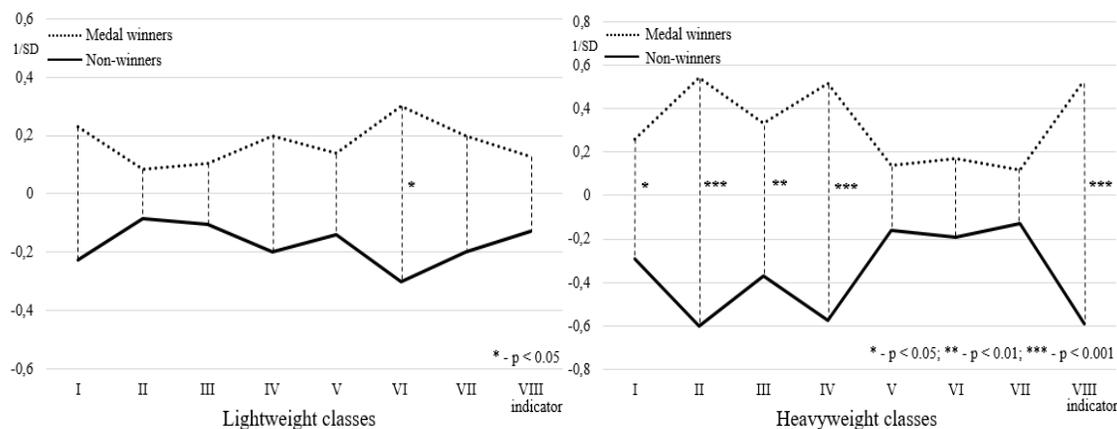


Figure 2. Fitness profiles of successful and less successful freestyle wrestlers (normalised to the whole group).

The logistic regression model revealed that in terms of fitness, the main determinants of success in Greco-Roman heavyweight wrestlers were agility, wrestling-specific fitness and special endurance ($p < 0.05$) (Table I). However, in the case of freestyle wrestlers, regardless of their weight class, the model did not show any significant determinants of success (Table II).

Table I. Logistic regression model for Greco-Roman lightweight and heavyweight wrestlers

Indicator	Dependent variable			
	Lightweight		Heavyweight	
	Estimate	95% CI	Estimate	95% CI
Standing broad jump (cm)	0.03	-0.05, 0.13	0.05	-0.01, 0.12
Pull-ups (number)	-0.32	-0.80, 0.01	0.07	-0.07, 0.22
Push-ups (number)	-0.04	-0.20, 0.08	-0.09	-0.20, -0.01
Wall bar hanging leg raises (number)	0.24	-0.54, 0.98	0.40	-0.03, 0.99
Zigzag ('envelope') run (s)	-0.01	-0.66, 1.55	2.39 *	0.59, 5.40
Wrestling carousel (s)	0.11	-0.62, 0.86	-0.83 *	-1.96, -0.18
Standing gymnastic bridge with return (s)	0.46	-0.25, 1.30	-1.15	-2.86, -0.02
Suplex throws of the mannequin (number)	-0.08	-0.42, 0.24	-0.92 *	-1.94, -0.30
Constant	-2.57	-48.47, 44.61	-7.07	-44.67, 33.96
Observations	29		33	
Akaike Inf. Crit.	45.121		42.371	

Note: * $p < 0.05$;

Table II. Logistic regression model for freestyle lightweight and heavyweight wrestlers

Indicator	Dependent variable			
	Lightweight		Heavyweight	
	Estimate	95% CI	Estimate	95% CI
Standing broad jump (cm)	-0.02	-0.09, 0.07	0.06	-0.03, 0.19
Pull-ups (number)	0.16	-0.01, 0.40	-0.09	-0.27, 0.06
Push-ups (number)	-0.11	-0.28, -0.01	-0.07	-0.21, 0.03
Wall bar hanging leg raises (number)	-0.26	-0.94, 0.31	-0.32	-0.96, 0.17
Zigzag ('envelope') run (s)	0.02	-1.09, 1.13	-0.42	-1.45, 0.44
Wrestling carousel (s)	2.31	0.30, 5.36	-0.06	-1.12, 0.10
Standing gymnastic bridge with return (s)	-0.75	-2.11, 0.47	0.05	-1.17, 1.48
Suplex throws of the mannequin (number)	-0.02	-0.34, 0.28	-0.031	-0.79, 0.06
Constant	-6.45	-54.62, 35.06	25.57	-1.17, 60.21
Observations	28		38	
Akaike Inf. Crit.	47.563		47.483	

Discussion

The aim of the study was to develop fitness profiles of successful and less successful wrestlers taking account of their wrestling styles, weight classes and performance in tournaments.

Despite numerous studies which described fitness profiles [Baić et al., 2007; Basar et al., 2014; Bayraktar & Koc, 2017; Lopez-Gullon et al., 2011; Mirzaei et al., 2013; Morán-Navarro et al., 2015; Sterkowicz & Starosta, 2005] and sought to identify key motor abilities of wrestlers representing different styles, there is still a scarcity of research involving the assessment of wrestling-specific skills.

Fitness profiles of successful and less successful wrestlers were different. In general, regardless of weight classes, successful athletes demonstrated higher fitness levels. Greater differences were noted in heavyweight wrestlers. It may indicate a more important role of physical fitness in wrestlers representing heavyweight classes. Similar observations were made when assessing fitness profiles of freestyle wrestlers. Moreover, the study on female wrestlers revealed that successful athletes manifested higher levels of motor abilities compared to their less successful counterparts and, contrary to male wrestlers, differences were similar regardless of body mass [Gierczuk et al., 2020].

The identification of success factors (motor abilities) in wrestling was an important finding. Based on the analysis of fitness profiles in the context of winning medals in major sporting events by wrestlers in different weight classes, it was shown that agility, wrestling-specific fitness and special endurance played a greater role in Greco-Roman heavyweight wrestlers only. As for successful and less successful freestyle wrestlers, no significant differences were noted. The findings clearly indicate that in male wrestling, training should differ depending on the wrestling style and weight class. For instance, special emphasis should be placed on developing dominant motor abilities in wrestlers representing different weight classes. Agility, wrestling-specific fitness and special endurance play a significantly greater role in heavyweight wrestlers. In all probability, due to its specificity, Greco-Roman heavyweight wrestling consists of actions that often involve lifts and throws which require high levels of motor abilities [Mirzaei et al., 2017]. An interesting fact is that in freestyle wrestling, no abilities were identified as the dominant ones in terms of achieving sports success. It is consistent with the general opinion that in terms of performance, the implementation of various techniques in freestyle wrestling is more important than motor abilities [Baić et al., 2007; Kajmovic et al., 2017; López González, 2014; Mirzaei et al., 2017]. Research results confirm a general opinion that freestyle wrestling, in which there occurs greater diversity of fighting techniques owing to a possibility of using lower limbs in attack and defense, is more complex in terms of technique, and motor preparation is not the most important element contributing to sports success. Studies also confirm the dominance of technical skills in lightweight wrestlers [García-Pallarés et al., 2011]. They manifest the highest number of technical and tactical actions during a fight. Moreover, lightweight competitors win their fights owing to a point advantage over their opponents that stems from the number and quality of performed actions, which explains a less significant role of motor preparation.

It is worth noting that the logistic regression models presented in the study should be treated with caution due to the fact that they concerned physical fitness only. It indicates that sports success is also determined by other factors such as somatic, technical, psychomotor or mental ones.

A proper training programme that includes individual fitness profiles of athletes is the key to success in wrestling as well as in other sports. Adequate implementation of training loads in particular microcycles of the periodization-based time structure of training that is regularly developed thanks to scientific advances and practice-related conclusions is also important [Bompa & Buzzichelli, 2019; Junior, 2020].

Despite the collected data on fitness-related determinants of success in wrestling, there are still a number of issues that need to be addressed. Further research should focus on seeking predictors of sports success in terms of wrestling styles, gender and the level of mastery of athletes who have been successful in the international arena, and it should be done by using a wider range of variables, e.g. somatic, technical and mental ones. Groups of study participants that would be more polarised in terms of body mass might make it possible to reveal significant differences and help to identify fitness-related performance factors more precisely.

Conclusions

Wrestlers' fitness profiles differ in terms of wrestling styles and weight classes. When it comes to developing motor abilities in wrestlers (regardless of their styles and weight classes), it is necessary to put emphasis on dominant components of physical fitness in the first place.

Identification of indices of physical fitness in successful wrestlers (medal winners) may constitute the basis for rationalisation of the training process in wrestling. It ought to be borne in mind when selecting training means oriented at improving dominant components of motor profiles of wrestlers. An important role in motor preparation, particularly in heavyweight Greco-Roman wrestlers, is played by agility, wrestling-specific fitness and special endurance, as these abilities significantly determine sports success.

Conflicts of interest

The authors declare no existing conflict of interest for the content of the article.

References

- Ackland, T., Elliott, B., & Bloomfield, J. (2009). Applied Anatomy and Biomechanics in Sport. Human Kinetics.
- Baić, M., Sertić, H., & Starosta, W. (2007). Differences in physical fitness levels between the classical and the free style wrestlers. *Kinesiology*, 39(2), 142-149.
- Balushka, L., Khimenes, K., Okopnyy, A., Pityn, M., & Verbovyi, V. (2020). Application of wrestling strength and speed exercises during the physical education of military students. *Journal of Physical Education and Sport*, 20(3), 2068-2075.
- Basar, S., Duzgun, I., Guzel, N.A., Cicioğlu, I., & Çelik, B. (2014). Differences in strength, flexibility and stability in freestyle and Greco-Roman wrestlers. *Journal of Back and Musculoskeletal Rehabilitation*, 27(3), 321-330.
- Bayraktar, I., & Koc, H. (2017). A study of profile and comparison for Turkish Greco-Roman and freestyle wrestlers who prepared for RIO 2016. *Science, Movement and Health*, 17(2), 190-199.
- Bompa, T., & Buzzichelli, C. (2019). Periodization. Theory and Methodology of Training. Human Kinetics.
- Cieslinski, I., Gierczuk, D., & Sadowski, J. (2021). Identification of success factors in elite wrestlers - An exploratory study. *Plos One*, 16(3).
- Demirkan, E., Kutlu, M., Koz, M., Özal, M., & Favre, M. (2014). Physical fitness differences between freestyle and Greco-Roman junior wrestlers. *Journal of Human Kinetics*, 41, 245-251.
- García-Pallarés, J., López-Gullón, J.M., Muriel, X., Díaz, A., & Izquierdo, M. (2011). Physical fitness factors to predict male Olympic wrestling performance. *European Journal of Applied Physiology*, 111(8), 1747-1758.
- Gierczuk, D., Cieśliński, I., Buszta, M., & Sadowski, J. (2020). Physical fitness profiles of elite freestyle male and female wrestlers. *Theory and Practice of Physical Culture*, 6, 15-17.
- Gierczuk, D., Bujak, Z., Cieśliński, I., Lyakh, V., & Sadowski, J. (2018). Response time and effectiveness in elite Greco-Roman wrestlers under simulated fight conditions. *Journal of Strength and Conditioning Research*, 32(12), 3433-3440.
- Hrysonmallis, C. (2011). Balance ability and athletic performance. *Sports Medicine*; 41(3), 221-232.
- Junior, N. (2020). Periodization models used in the current sport. *MOJ Sports Medicine*, 4(2), 27-34.
- Kajmovic, H., Rađo, I., Kapur, A., Mekić, A., & Kapo, S. (2017). Differences in performed actions of winners and defeated female cadet wrestlers in a standing position. [In:] M. Baić, P. Drid, W. Starosta, D. Curby, H. Karnincic (ed.) *Applicable Research in Wrestling: International Scientific and Professional Conference on Wrestling*, Novi Sad, Zagreb 5-7 May, 2017: proceedings book, 248.
- Kostovski, Ž., Georgiev, G., Shala, S., & Ibri, L. (2011). Relations between motor abilities and the wrestler's competitive effectiveness. *Acta Kinesiologica*, 5(2), 72-75.
- López González, D.E. (2014). Technical-Tactical Performance in Greco-Roman Wrestling: Analysis of 2013 Senior World Championships Through Multivariate Analysis. *International Journal of Wrestling Science*, 4(1), 95-130.
- López-Gullón, J.M., Muriel, X., Torres-Bonete, M.D., Izquierdo, M., & García-Pallarés, J. (2011). Physical fitness differences between Freestyle and Greco-Roman elite wrestlers. *Archives of Budo*, 7(4), 217-225.
- Marković, M., Kasum, G., & Dopsaj, M. (2017). Comparison of freestyle wrestlers' competitive activity at the European competitions in 2013, 2014 and 2015. [In:] M. Baić, P. Drid, W. Starosta, D. Curby, H. Karnincic (ed.) *Applicable Research in Wrestling: International Scientific and Professional Conference on Wrestling*, Novi Sad, Zagreb 5-7 May, 2017: proceedings book, 226-238.
- Melki, H., Bouzid, M., & Fadhloun, M. (2019). Correlation between Morphological and Functional Variables during a Specific Wrestling Test For Tunisian Cadet Greco-Roman Wrestlers. *Journal of Physical Education and Sport*, 19(4), 1282-1287.
- Mirzaei, B., Curby, D.G., Barbas, I., & Lotfi, N. (2011). Anthropometric and physical fitness traits of four-time world Greco-Roman wrestling champion in relation to national norms: A case study. *Journal of Human Sport and Exercise*, 6, 406-413.
- Mirzaei, B., Curby, D.G., Barbas, I., & Lotfi, N. (2013). Differences in some physical fitness and anthropometric measures between Greco-Roman and freestyle wrestlers. *International Journal of Wrestling Science*, 3(1), 94-102.
- Mirzaei, B., Moghaddam, M.G., & Yousef, H.A. (2017). Analysis of Energy Systems in Greco-Roman and Freestyle Wrestlers Who Participated in the 2015 and 2016 World Championships. *International Journal of Wrestling Science*, 7(1-2), 35-40.
- Morán-Navarro, R., Valverde-Conesa, A., López-Gullón, J.M., De la Cruz-Sánchez, E., & Pallarés, J.G. (2015). Can balance skills predict Olympic wrestling performance? *Journal of Sport and Health Research*, 7(1), 19-30.
- Nagovitsyn, R., Zhuikova, S., Kondratiev, N., Osipov, A., Zhavner, T., & Vapaeva, A. (2018). Influence of sports asymmetry and ambidexterity of ground wrestling on the level of competitive performance of Greco-Roman style wrestlers. *Journal of Physical Education and Sport*, 18(4), 2472-2477.
- Nikooie, R., Cheraghi, M., & Mohamadipour, F. (2017). Physiological determinants of wrestling success in elite Iranian senior and junior Greco-Roman wrestlers. *The Journal of Sports Medicine and Physical Fitness*, 57(3), 219-226.

- Platonov, V., & Nikitenko, A. (2019). Agility and coordination testing in hand-to-hand combat sport. *Polish Journal of Sport and Tourism*, 26(2), 7-13.
- Rutkowska, K., Gierczuk, D., & Buszta, M. (2020). Selected psychological factors in elite Greco-Roman wrestlers at various levels of competition. *Journal of Physical Education and Sport*, 20(3), 2277-2282.
- Sterkowicz, S., & Starosta, W. (2005). Selected factors influencing the level of general fitness in elite Greco Roman wrestlers. *Journal of Human Kinetics*, 14, 93-104.
- Tünnemann, H. (2017). Technical-tactical combat behavior in the wrestling finals of the 2016 Olympic Games Rio in comparison to the 2012 OG London. [In:] M. Baić, P. Drid, W. Starosta, D. Curby, H. Karnincic (ed.) *Applicable Research in Wrestling: International Scientific and Professional Conference on Wrestling*, Novi Sad, Zagreb 5-7 May, 2017: proceedings book, 13-22.
- Tünnemann, H., Curby, D. (2016). Scoring Analysis of the Wrestling from the 2016 Rio Olympic Games. *International Journal of Wrestling Science*, 6(2), 90-116.