International Journal of
Wrestling Science

International Journal of Wrestling Science

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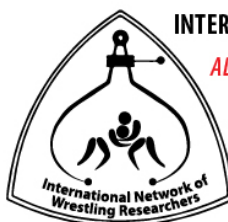David Curby, EdD
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International Journal of Wrestling Science editors endorse the principles embodied in the Helsinki Declaration and expect that all research involving humans has been performed in accordance with these principles. All human studies must have been approved by the investigator's Institutional Review Board. A copy of the relevant documentation should be included with the manuscript. Furthermore, International Journal of Wrestling Science follows the ICMJE's Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals.

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Cover Photo Credit: UWW Photo from the Oslo World Championships showing Akari FUJINAMI (JPN) df. Luisa Elizabeth VALVERDE MELENDRES (ECU). The 18 year old FUJINAMI won the championship outscoring her opponents 41-0.

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Editor's Comments

The study of wrestling provides mnotes any avenues and areas for research. It has been an objective of the International Journal of Wrestling Science to include all facets of our sport. This issue contains an overview of the status of wrestling research by Emerson Franchini, along with the Annual Compilation of Wrestling Research for 2021. I would like to include a brief note that is an example of the interesting and beautiful aspects from the study of wrestling.

WRESTLING IS CENTRAL TO SOME OF THE MOST FAMOUS LITERATURE FROM ANCIENT HISTORY
Gilgamesh was a hero in ancient Mesopotamian found *Epic of Gilgamesh*, an epic poem written in Akkadian during the late 2nd millennium BC. Gilgamesh was highly skilled in wrestling and utilized it in his exploits.

Homer's epic poetry in the Iliad and Odyssey written in ancient Greek during the 8th century BC. contain many references to wrestling. Odysseus in particular is described as a skilled wrestler. This skill is vividly described in the Iliad with his bout with Ajax.

The Shahnameh is a long epic poem written by the Persian poet Ferdowsi between c. 977 and 1010 CE and is the national epic of Iran. Rostam is the most celebrated legendary hero in Shahnameh and Iranian mythology. Rostam was always represented as the mightiest of Iranian paladins (holy warriors). He was highly skilled in wrestling, which he often employed in his battles.

I want to share a beautifully illustrated example of Rostam found in a modern production: **Shahnameh: The Epic of the Persian Kings.** Translated and adapted (to prose) by Ahmad Sadri, and illustrated by Hamid Rahmanian**.** Published by Liveright: New York (2017).

The Challenge of Puladvand (p. 409)
Puladvand, who was known for his heroic frame and prodigious talents in the use of lariat and mace, led a huge mass of warriors to where the Iranian army was camped. A loss to Puladvand would doom the cause of Iran. A wave of panic shook the Iranians, and all eyes turned to Rostam for help. Rostam stepped up to challenge the mighty Puladvand.
After exchanging taunts, the two champions pounded each other with their heavy maces until it was clear that they were in a stalemate. They agreed to settle the contest by wrestling. Rostam lifted his opponent high upon his neck and pounded him on the ground with such force that he was left there for dead.

Sincerely yours in the advancement of Wrestling,

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FUTURE ISSUES IN WRESTLING RESEARCH - A SPORT SCIENCES PERSPECTIVE

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INTRODUCTION

As the most traditional combat sport in the Olympic Games, wrestling has an enormous visibility, especially due to the high number of medals at stake. Moreover, wrestling is part of continental competitions (e.g., Pan-American Games, European Games, Asian Games, African Games) and world championships for different age groups (United World Wrestling, 2021). High-level athletes development is long-term endeavor demanding specialized professionals to provide the best approach available. Thus, the cost of this process can be quite high, and those managing sport programes need to decide where, how and when to direct the support. Therefore, countries try to optimize their limited resources to sports with higher appeal or strategically relevant to the sport policy. In this context, the scientific evidence has been cited as an important element in the process of long-term athlete development (Rees et al., 2016). Indeed, a study reported that the number of papers related to Olympic sports was positively correlated to the medal table in the Rio Olympic Games: Spearman $r = 0.84$ for the relationship between papers about Olympic sports and total number of medals, and Spearman $r = 0.70$ for the relationship between papers about Olympic sports and number of gold medals (Moreira and Franchini, 2017). Additionally, it was demonstrated that the sport sciences scientific production increased linearly in countries with cities hosting the summer Olympic Games and that this increment was more accentuated after the host city announcement compared to a period before this fact (Franchini and Kokubun, 2019).

Specific strategies have been used to optimize the interaction between coaches and sport scientists, including the creation of sports institutes such as the Australian Institute of Sport (Rees et al., 2016), L'Institut National du Sport, de l'Expertise et de la Performance in France (Millet et al., 2021), the USA Olympic Training Center in Colorado Springs, the Japanese Institute of Sports Sciences, the English Institute of Sport to name only a few, and the insertion of sport scientists in the multidisciplinary technical commission working directly with high-level athletes (Barlett and Drust, 2020). It is also important to verify what has been published about specific sports to better understand the information available, and to guarantee that cutting-edge knowledge is provided to coaches. In this context, a bibliometrics analysis of Olympic combat sports research (Franchini et al., 2018) indicated that investigations about these sports represent around 1% of all scientific information available in Sport Sciences, even though these sports represent around 20-25% of all medals disputed in the Olympic Games. Therefore, this is an area to be consolidated in terms of research. More recently, Millet et al. (2021) analyzed the publications related to Olympic sports in exercise and sport journals indexed in PubMed, and included wrestling in their investigation. They found 405 articles related to wrestling and considered 400 in their final analysis, reporting the five most cited articles: three investigating rapid weight loss (Oppliger et al., 1996; Steen and Brownell, 1990; Webster et al., 1990), one related with coping strategies of U.S. Olympic wrestlers (Gould et al., 1993), and one analyzing the physiological and performance responses to a simulated wrestling tournament (Kraemer et al., 2001). Although the predominance of the physiological aspects among these articles, the most cited one was related to sport psychology (i.e., coping) (Gould et al., 1993). Therefore, these three main topics seem to be the mainstream in wrestling research. Indeed, when reporting the main research topics in wrestling-related research, Millet et al. (2021) found the following order: physiology, injuries and medicine, training and testing, psychology, performance and biomechanics and equipment. Knowing what have been done is essential to find the gaps in wrestling research. Thus, the main goals of the present article is to provide an overview of sport sciences wrestling-related research, and to present topics that deserve information. While the first goal can be achieved via a more formal and objective way, the second is based on the experience of the author and should be taken with caution.

SPORT SCIENCES RESTLING-RELATED RESEARCH

Millet et al. (2021) analyzed the scientific publication in 116 sport/exercise journals on PubMed for both summer (40) and winter (10) Olympic sports and observed that team sports, specially American professional sports were those modalities with more articles published and cited. Therefore, it seems that social relevance of sports affect the scientific interest and it was suggested by these authors that sports with more economical impact may be the main reason for this. Although combat sports are practiced worldwide and represented around 26% of all medals disputed during the Tokyo 2020 Olympic Games, the scientific interest in these sports is not high. This is confirmed by the fact that only nearly 1% of the Sport Sciences research indexed in the Web of Science was related to Olympic combat sports (Franchini et al., 2018). Specifically regarding wrestling, no study analyzed the bibliometrics of scientific publications. This kind of information can be valuable to understand what has been investigated in this sport, whether this knowledge have been incorporated to training routines and what should be investigated to provide better decision-making concerning training procedures.

To identify the wrestling-related scientific research, a search was conducted in Web of Science in November 4th 2021, using the terms "wrestling" and "wrestler" in the Sport Sciences area. The results retrieved 1196 publications, from which 913 were original articles, and 59 were review articles. Therefore, these 972 articles were analyzed. Briefly, the main goal was to determine who investigated wrestling and what aspect was studied, which universities supported these studies, which countries have more tradition in this type of research, and where these articles were published, and when these investigations were published.

Table 1 presents the authors who published more than 10 articles related to wrestling in Sport Sciences area and a representative example of research conducted by each author.

Table 1: Researchers with more than 10 wrestling-related articles indexed in the Web of Science for the Sport Sciences area, and example of a representative study.*

Author	Number of articles published	Title of representative article published
Housh TJ	23	Midwest wrestling study - prediction of minimal weight for high-school wrestlers
Johnson GO	23	Allometric scaling of isokinetic peal torque: the Nebraska Wrestling Study
Comstock RD	19	Epidemiology of concussions among United States high school athletes in 20 sports
House DJ	17	Estimation of body density in young wrestlers
Utter AC	16	NCAA rule change improves weight loss among national championship wrestlers
Horswill CA	12	Weight loss in wrestlers
Kerr ZY	12	Epidemiology of sports-related concussion in NCAA athletes from 2009-2010 to 2013-2014: incidence, recurrence, and mechanisms
Franchini E	11	Physical and physiological attributes of wrestlers: an update
Karnincic H	11	Lactate profile during Greco-Roman wrestling match
Nakazato K	11	Trunk muscle strength and disability level of low back pain in collegiate wrestlers
Oppliger RA	11	Weight loss practices of college wrestlers

Stout JR	11	Accuracy of near-infrared interactance instruments for estimating percent body fat in youth wrestlers
Oopik V	10	Effect of rapid weight loss on metabolism and isokinetic performance capacity - a case study of two well trained wrestlers
Timpmann S	10	Dietary sodium citrate supplementation enhances rehydration and recovery from rapid body mass loss in trained wrestlers

* the study selected was the most cited, except when the article was already listed as a representative study of other author given many studies were co-authored by these researchers (in this case the second most cited article was listed). Additionally, papers selected have included wrestlers as participants, and analyzed separately from other athletes, or were reviews specifically about wrestling. Two authors (Gabett TJ, n = 15 publications; and Johnston RD, n = 10 publications) were not included in this list as the term "wrestling" appeared in their publications but in the context of rugby matches.

Based on the most cited articles presented in Table 1, it is clear that investigations about weight loss and its effects, followed by techniques to determine body composition, were the main topic of the most prolific researchers in this field. Injuries of wrestlers taking part in multi-sport competitions, strength profiling of wrestlers, and physiological responses to wrestling were the other topics studied. It is likely that this scenario was determined by the high prevalence of rapid weight loss in wrestlers, and therefore, a practical problem faced by coaches and strength and conditioning professionals was investigated by researchers. It is important to note that these topics are similar to the ones reported by Millet et al. (2021) for Olympic sports in general, and wrestling specifically, i.e., physiology, injuries, training and testing, and performance, but did not included other topics such as psychology and biomechanics.

Figure 1 presents the number of wrestling-related publications per year, since the inception of Web of Science register (i.e., 1973) up to 2020.
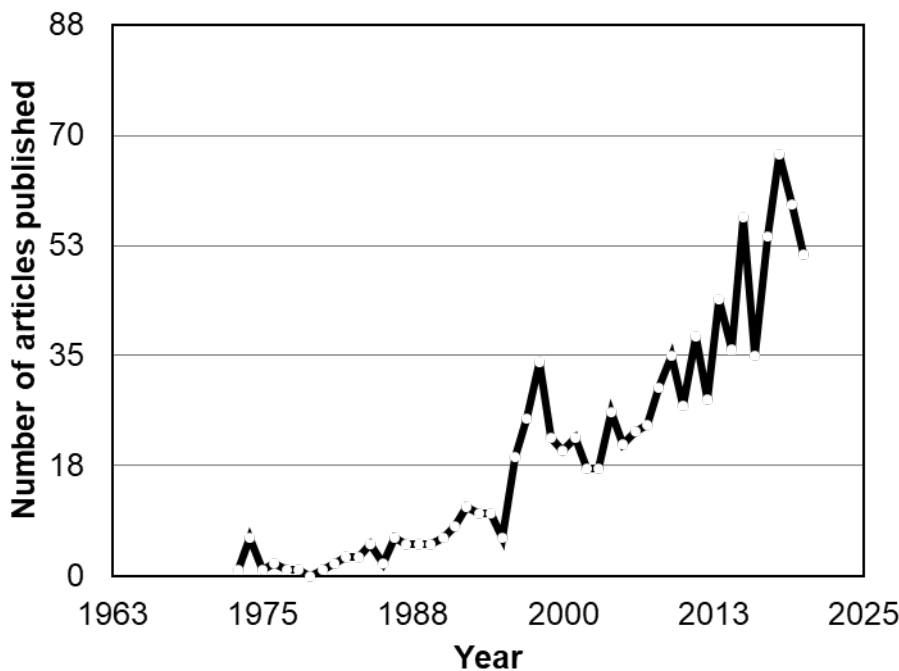

Figure 1: Number of wrestling-related articles published in Sport Sciences area and indexed in the Web of Science between 1973 and 2020.

Figure 1 indicates a steady increment in wrestling publication from the 1970's up to middle 1990's. Despite a great increase in 1997, this was followed by a subsequent decrease in early 2000's, and a new increment after 2009. The number of publications peaked in 2018 and presented a new decrease thereafter. Although it is difficult to explain the reasons for the variations observed in Figure 1, it is clear that wrestling-related research increased considerably in the last decade, which is similar to the findings observed in Olympic combat sports (Franchini et al., 2018) and Olympic sports in general (Millet et al., 2021). Therefore, it seems that Sport Sciences is consolidating as a scientific area, and wrestling is following this tendency, even though with a small percentage of papers when compared with other sports (e.g., team sports and American professional sports) (Millet et al., 2021).

Reading scientific articles can be a valuable source of knowledge to coaches, but the academic writing style may be a barrier to access the information within the papers (Williams and Kendall, 2007). To overcome this barrier clubs, federations and other wrestling organizations could set a scientific partnership with a researcher or have a person dedicated to constantly search for these articles and provide a summary of the findings and a more palatable form. Indeed, the International Network of Wrestling Research (INWR) is an initiative to provide research-based information related to wrestling, with more than 500 members from 89 countries (INWR, 2021). The INWR, in conjunction with United World Wrestling (UWW), has published the International Journal of Wrestling Science since 2011. Additionally, a special aspect of its website is the Annual Reviews and Compilations of Wrestling Research section, which presents a list of references published each year related to this sport. This is a initiative of Dr. David Curby (USA), who has been doing this compilation since 2005. Thus, this can be a valuable source for coaches, strength and conditioning professionals and researchers to find and select investigations in different scientific fields about wrestling, especially because it presents articles from different indexes sources and even non-indexed articles.

The Institute of Applied Training Science in Leipzig (IAT) has developed SPONET which is a training science search engine. The Institute for Applied Training Science (IAT), founded in 1992, is the central research institute for German elite and young athletes. It currently provides access to over 100,000 sport science articles. Wrestling is one of 59 sports for which a bibliographic database is provided. The database contains 3,182 relevant items related to Wrestling. Searches can apply the presented keywords (training control, long-term performance, build-up, perception, recovery, sport physiology, weightlifting, technique, junior elite sport, movement co-ordination, endurance, freestyle wrestling, peaking for a competition, training periodization, motivation, training, competition, Greco-Roman wrestling, tactics, movement, fatigue, sport psychology, performance diagnostics, coaching, training planning, speed strength, biomechanics, strength, nutrition), or you can search the database on your own.

Regarding the present search, the following journals published more than 25 articles about wrestling: Journal of Strength and Conditioning (n = 92), Medicine and Science in Sports and Exercise (n = 69), Archives of Judo (n = 48), American Journal of Sports Medicine (n = 45), Journal of Sports Medicine and Physical Fitness (n = 43), Journal of Athletic Training (n = 42), Physician and Sports Medicine (n = 32), Clinical Journal of Sports Medicine (n = 30), International Journal of Sports Medicine (n = 29), British Journal of Sports Medicine, and Human Sport Medicine (n = 25). Most of these journals are top-level Sport Sciences journals and therefore this indicates that high-level research has been conducted about wrestling. Thus, these journals can be a first choice for those interested in this type of research. Additionally, the wrestling-specific scientific journal the International Journal of Wrestling Science, which has been published since 2011 and 279 articles have been published in this open access journal. (INWR, 2021).

Concerning the countries where wrestling research was conducted, the present search indicated the following as the top 10 countries: United States of America (n = 436), Poland (n = 79), Turkey (n = 55), Australia (n = 52), Japan (n = 47), Russia (n = 39), England (n = 38), Brazil (n = 37), Iran (n = 33), and Canada (n = 31). This list is quite similar to that reported for countries conducting research about Olympic combat sports (Franchini et al., 2018), and includes countries with a long tradition and top performance in wrestling in the Olympic Games and World Championship. This confirms the hypothesis that Sport Sciences research is driven by the social relevance of specific modalities in some countries (Millet et al., 2021).

Finally, caution should be taken when considering these data because maybe other wrestling-like combat sports (e.g., sumo wrestling, arm wrestling and Asian mas wrestling) may have be counted in the total of articles, even though the number of such article may represent a small percentage of the total. Future searches should analyze each article, and determine the main topics investigated.

FROM RESEARCH TO INTERVENTION
Classically, Sport Science's goals have been established as to improve performance, to prevent injury, and to provide relevant information to coaches and practitioners to allow an intervention resulting in improved athlete's performance (Bishop, 2008). However, it is clear that those conducting research in universities have

a slightly different goal from those working directly with athletes, and this create a gap between research and intervention. The gap between investigations and interventions is likely caused by the highly specialized language used in academic journals, the difficulty to disseminate the scientific information to coaches, the conservative practices by some coaches (who avoid introducing modifications in their training program), and to the congested activities executed by coaches, resulting in lack of time to study (Bishop, 2008). Some strategies have been proposed to build a bridge between Sports Sciences and intervention, recommending the insertion of a sport scientist in the multidisciplinary technical commission working with athletes (Barlett and Trust, 2020). According to these authors, this would allow a better understanding by sport scientists about the modality, resulting in improved research questions, while providing evidence-based information to other professionals.

Considering the wrestling-related research described above, the following can be considered relevant for future investigations:
(a) Training monitoring and training modeling - what are the best instruments to monitor wrestlers' training? How training monitoring variables may predict future performance? Is it possible to model the training responses based on training stimuli? How wrestlers' initial levels of physical fitness affect the response to training intensity and volume?;
(b) Weight loss - How to educate athletes to avoid rapid weight loss processes? How to optimize the weight loss process and maximize the recovery between the weigh-in and the beginning of competition? What are the long-term effects of rapid weight loss on wrestlers' health, specially during the post-competitive career? What are the short- and long-term effects of rapid weight loss in the mental health of wrestlers? Although part of these aspects have been considered in some investigations, more information is needed, especially when considering the recent rule changes in wrestling (including the weigh-in being executed closer to the competition);
(c) Physiological and biomechanics measurements during wrestling-specific actions - due to the nature of wrestling, the execution of physiological and biomechanics measurements is difficulty. However, the technology has been improving in these areas, and it is likely that in the near future it will be possible to conduct such measurements. This will provide relevant information for strength and conditioning training design;
(d) Wrestling-specific test development - although some wrestling-specific tests are available, it is important to have specific tests to evaluate different physical capacities (e.g., aerobic power and capacity; anaerobic power and capacity; maximal isometric strength; maximal dynamic strength; strength-endurance). This may involve the development of specific ergometers and equipment;
(e) Injury prevention - What are the best interventions to reduce injuries during wrestling training and competitions? How training intensity and volume affect the injury risk of wrestlers? How the competition calendar affects the injury risk? Is physical fitness - or a specific physical capacity - related to injury prevention?;
(f) Teaching and learning - How beginner's wrestlers learn specific techniques? What are the best progressions to teach the techniques? The age wrestlers start to practice has an influence on their adherence to practice? How early specialization affect drop off rates in wrestling? How athletes evolve their technical skill along their careers?;

Certainly other relevant topics may be investigated, depending on several aspects, such as countries' economy, social representation of wrestling, wrestling culture (including number of practitioners and coaches), etc.

FINAL CONSIDERATIONS
Despite the long tradition of wrestling, Sport Sciences scientific research about this sport is at its beginning. It is likely that investigations in this area can provide valuable contributions to improve coaches, strength and conditioning professionals, and practitioners involved with wrestling. However, as for other sports, it is necessary that a stronger relationship be set between those working directly with wrestling and researchers. Even though this is not an easy task, the investment in this process may pay off.

REFERENCES
Bartlett, J. D. and B. Drust (2021). "A framework for effective knowledge translation and performance delivery of Sport Scientists in professional sport." European journal of sport science **21**(11): 1579-1587.

Bishop, D. (2008). An Applied Research Model for the Sport Sciences. Sports Med 2008; 38 (3): 253-263.

Franchini, E., Gutierrez-Garcia, C, Izquierdo, E. (2018). Olympic combat sports research output in the Web of Science: a sport sciences centered analysis. Journal of Martial Arts Anthropology", Vol. 18, no. 3 (2018), pp. 21–27.

Franchini, E., Kokubun, E. (2019). Sport sciences research and Olympic host countries. Sport Sci Health 15, 259–261.

Gould D, Eklund RC, Jackson SA. (1993). Coping strategies used by U.S. Olympic wrestlers. Res Q Exerc Sport. 64(1): 83-93.

INWR website, (2021). https://inwr-wrestling.com

Kraemer WJ, Fry AC, Rubin MR, Triplett-McBride T, Gordon SE, Koziris LP, et al. Physiological and performance responses to tournament wrestling. Med Sci Sports Exerc. 2001 Aug;33(8):1367-78.

Oppliger RA, Case HS, Horswill CA, Landry GL, Shelter AC. (1996). American College of Sports Medicine position stand. Weight loss in wrestlers. Med Sci Sports Exerc. 28(6):ix-xii.

Millet, G. P., et al. (2021). "Olympic Sports Science—Bibliometric Analysis of All Summer and Winter Olympic Sports Research." Frontiers in Sports and Active Living 3.

Rees, T., Hardy, L., Güllich, A., Abernethy, B., Côté, J., Woodman, T., ... & Warr, C. (2016). The great British medalists project: a review of current knowledge on the development of the world's best sporting talent. Sports medicine, 46(8), 1041-1058.

SPONET.   https://www.iat.uni-leipzig.de/datenbanken/iks/sponet/

Steen SN, Brownell KD. (1990). Patterns of weight loss and regain in wrestlers: has the tradition changed? Med Sci 176 Sports Exerc.; 22(6):762-8.

United World Wrestling. http://uww.org

Webster S, Rutt R, Weltman A. (1990). Physiological effects of a weight loss regimen practiced by college wrestlers. Med 135 Sci Sports Exerc. 22(2):229-34.

Williams, S. J., & Kendall, L. (2007). Perceptions of elite coaches and sports scientists of the research needs for elite coaching practice. Journal of sports sciences, 25(14), 1577–1586.

INWR Annual Compilation of Wrestling Research for 2021

Abramova, T. F., et al. (2021). "Workout intensity management standards for 6-7 year-old wrestlers." Theory and Practice of Physical Culture(7): 7-10.

Objective of the study was to offer workout intensity management standards for the 6-7 year-old wrestlers based on the energy mechanisms functionality and physical fitness tests and analyses. Methods and structure of the study. We sampled for the study, on the family and coach`s consent, three 7 year-old freestyle wrestlers having a two-year training experience, and tested them for: physical development (including body length and mass, BMI, muscle and fat mass, vital capacity, blood pressure and heart rate tests), physical fitness (including carpal strength, flexibility, standing long jump, shuttle sprint tests); speed-stepping treadmill tests till muscular failure (1.75 m/s stepped up by 0.25 m/s every 2 min). Exhaled carbon dioxide/ oxygen (CO_2/ O_2) was tested by Metalizer II Gas Analyzer test system (Cortex, Germany) and HR was tested prior to, during and after workouts with an ECG support. Blood lactate levels were tested after every workout stage in the rehabilitation process. The tests were designed to fix the maximal aerobic capacity, anaerobic threshold and oxygen uptake efficiency ratio. The anaerobic threshold range was verified by the pulmonary ventilation maximums with ventilation equivalents versus the lactate variations to obtain indirect anaerobic threshold rates and limits for the workout intensity zones. Results and conclusion. Despite the individual differences in the run times and speeds and physiological energy costs, every sampled athlete was tested to mobilize mostly the anaerobic energy mechanisms in the failure workout tests, with the relative energy demand kept at certain level; and the same applies to efficiency of the aerobic-anaerobic transition mechanisms, whilst the lactic efficiency was tested relatively low. The study to produce the workout intensity zoning by the anaerobic metabolism threshold related HR found the age-specific threshold achieved at 170+ beats/min. The key finding of the study is that the 6-7-year-old wrestlers` anaerobic threshold is attained at 170+ beats/ min and may be effectively used for the workout zoning purposes. Workout intensities in excess of this level may result, as we found, in irregularities of the cardiovascular system adaptation to the sport-specific workloads in long-time trainings.

Andrade, A., et al. (2021). "Many medals, but few interventions: the paradox of sports psychology research and Olympic combat sports." Sport Sciences for Health **17**(2): 481-485.

Background: In the Tokyo 2021 Olympics, combat sports (boxing, fencing, judo, karate, taekwondo, and wrestling) will play a leading role, constituting approximately 22% of all the contested medals. For competitive success, there is a strong connection between combat sports and high specific emotional burdens of matches. Purpose: To analyze the scientific production on sports psychology in Olympic combat sports, through a scoping systematic review. Methods: A computer literature search was conducted in the PubMed database (up to December 2019). The keywords used were associated with Olympic combat sports and sports psychology. Results: The electronic search returned 610 articles. After applying the eligibility criteria, 67 studies were included in this scoping systematic review. However, only two studies included some type of psychological intervention. Conclusion: This scenario is troubling given the prominence of combat sports in Summer Olympic Games.

Arı, Y. (2021). "EFFECTS OF DIFFERENT STRETCHING METHODS ON SPEED, JUMP, FLEXIBILITY AND UPPER EXTREMITY PERFORMANCE IN WRESTLERS." Kinesiologia Slovenica **27**(1): 162-176.

The aim of this study is to investigate the acute effects of different stretching methods on acceleration, vertical jump (CMJ), flexibility and upper extremity performance of young wrestlers. 8 young female wrestlers (15.37 ± 1.06 years; 162.46 ± 4.12 cm and 57.47 ± 6.41 kg) participated in the study voluntarily. Stretching methods were divided into five groups: control (no stretching), static, dynamic, static + dynamic and dynamic + static. The findings showed faster speed performance after control (p = .012; η^2 = 0.57), dynamic stretching (p = .050; η^2 = 1.11) and static + dynamic combined stretching (p = .043; η^2 = 0.96) compared to static stretching; and there is a statistically significant positive difference according to the test averages after dynamic stretching (p = .050; η^2 = 0.91) compared to dynamic + static combined stretching (p<0.05). Vertical jump performance, according to

the control warming up, a statistically significant difference has been found according to the test averages after dynamic stretching (p = 041; η² = 1.17) and static + dynamic combined stretching (p = .043; η² = 1.07). No difference was found in flexibility and medicine ball throwing performances according to different stretching protocols (p>0.05). It was determined that the acute effect of static stretching had a negative effect on acceleration performances and dynamic stretching caused an increase in jump performance. This study suggests that dynamic and static + dynamic stretching can be used in young wrestlers to provide better performance in acceleration and jumping skills during warm-up sessions.

Bačík, V. (2021). "Olympic medalists of the modern summer Olympic games 1896–2016." Journal of Maps **17**(1): 145-153.

The aim of the work in the presented paper was the creation and subsequent distribution of a database of Olympic medalists of the modern Summer Olympic Games in the period 1896-2016. We examined historical statistics from the perspective of an individual approach; or more specifically, for each Olympic medalist as an individual athlete awarded with an Olympic medal. The results are presented on a map showing the number of medalists in each country. In total, we recorded 33152 Olympic medals in the database altogether, which were won by a total of 24287 athletes. These represented a total of 149 countries, including those that no longer exist due to geopolitical changes in the last century. All medals awarded at the level of states and individual sports are displayed in a detailed preview on the website, which is an integral part of the submitted paper.

Barton, D. and G. DeSilva (2021). "An Update on Simple Elbow Dislocations: A Protocol for Early Return to Sport in High School Wrestlers." Curr Sports Med Rep **20**(5): 266-270.

The principles and management of simple elbow dislocations have evolved over time. In the past, a conservative approach of immobilization and slow rehabilitation were used. More modern treatments emphasize an understanding of the soft tissues about the elbow joint and prescribe an aggressive approach to regaining motion. Elbow stiffness is a common effect of the injury. We outline our treatment principles in a series of high school wrestlers with simple elbow dislocation. The ultimate goal is to return to sport in a safe but early timeframe. We recommend a brief period of immobilization with close follow-up and no motion restrictions after immobilization is removed. This review and case series emphasize the importance of aggressive but safe return to sport in high school wrestlers with an elbow dislocation.

Baurzhan, M., et al. (2021). "Modern approaches for diagnosing transformations of the heart in qualified athletes." Journal of Physical Education and Sport **21**(2): 813-818.

The lack of clear standards for medical supervision of athletes considerably limits the ability to diagnose and prevent overstrain of the cardiovascular system. To date, in the Republic of Kazakhstan, an assessment of the significance of early cardiomarkers, reflecting the state of maladjustment of the heart to physical exertion among highly qualified athletes involved in martial arts, has not been performed. Aims: The aim of this study is to determine the level and diagnostic significance of cardiac biomarker IL1RL1 (sST2 - serum-soluble) and the role of psychological stress on the risk of cardiovascular disease in qualified sport veterans engaged in speed-strength sports. Methods: A prospective study on wrestlers was performed at the Centre for Sports Medicine and Rehabilitation (Almaty, Republic of Kazakhstan). All participants (n = 30) were males aged 30 to 44 years s, masters of sports of international class, and honoured masters of sports). The control group consisted of volunteers (VO) (n = 30). The sST2 level was determined before (BT) and immediately after (AT) training. Anthropometric and hemodynamic parameters of athletes were studied along with electrocardiography and echocardiography tests. Results: The average age of 30 athletes was 36.3 ± 0.5 years; the largest proportion of athletes was 35-39 years old (66.7%, n = 20); 6 sports veterans (20%) were 30-34 years old; the smallest proportion of athletes was under 40-44 years old (13.3%, n = 5). According to the electrocardiography (ECG) data, minor deviations from the norm (16.6 %) and abnormal ECG (30%) were identified. The echo-CG data showed "moderate" and "pronounced changes" in 40.0% and 60.0% of cases, respectively. The sST2 level of VO (337.1 ± 61.8 pg/mL) was lower than that of BT (570.1 ± 32.6 pg/mL) and AT (768.7 ± 71.6 pg/mL) (p < 0.05).IL1RL1 (ST2) showed high sensitivity in determining the maladaptation of the cardiovascular system to physical exertion in highly qualified sports veterans (p > 0.05). Conclusion: Athletes' sST2 levels exceeded thresholds both before and after training. Our findings indicate that the elevated sST2

concentrations in athletes can be used as the predictive value show maladaptation of the cardiovascular. However, it requires further intensive studies.

Berg, M. A., et al. (2021). "Tinea Gladiatorum Prevalence Among Wrestlers in the Era of Required Skin Inspection." Asian Journal of Sports Medicine **12**(2): 1-4.

Transmittable skin infections in sport are a concern, especially for wrestlers. Current methods for limiting tinea gladiatorum transmission in United States high school wrestling include a required skin inspection protocol. Tinea prevalence before and after the skin inspection protocol was instituted is not widely known. We prospectively determined tinea prevalence among a Minnesota high school wrestler cohort over their 12-week season and compared this to point-in-time incidences reported in wrestlers not subject to a skin inspection protocol. Wrestlers having a suspicious rash at the skin inspection (raised, red, > 5mm diameter, and with dry flaky scale) were recruited. Among suspicious rashes, tinea gladiatorum infection was determined using direct microscopy with chlorazol black staining. Thirty-eight of 510 wrestlers (7%) developed a rash suspicious for tinea. Thirty-four wrestlers that had rash(s) were enrolled and their rash was tested. Twenty-two of 510 wrestlers developed tinea gladiatorum throughout the season. Tinea gladiatorum prevalence was 4.3% (95% CI 2.5-6.1%). Four wrestlers with rash were not available for testing (unable to obtain timely consent (two) or obtain adequate sample(two)). Prevalence was less than suggested by the incidences previously reported in wrestling populations.

Bestwick-Stevenson, T., et al. (2021). "Association of Sports Participation With Osteoarthritis: A Systematic Review and Meta-Analysis." Orthopaedic Journal of Sports Medicine **9**(6): 1-15.

Background: The association between participating in sport and osteoarthritis is not fully understood. Purpose: To investigate the association between osteoarthritis and participating in sports not listed in previous reviews: American football, archery, baseball, bobsleigh, curling, handball, ice hockey, shooting, skeleton, speed skating, and wrestling. Study Design: Systematic review; Level of evidence, 3. Methods: We searched 4 electronic databases and hand searched recent/in-press editions of relevant journals. The criteria for study selection were case-control studies, cohort studies, nested case-control studies, and randomized trials with a control group that included adults to examine the effect of exposure to any of the included sports on the development of osteoarthritis. Results: The search returned 6197 articles after deduplication. Nine studies were included in the final review, covering hip, knee, and ankle osteoarthritis. There were no studies covering archery, baseball, skeleton, speed skating, or curling. The 6 sports included in the review were analyzed as a collective; the results of the meta-analysis indicated that participation in the sports analyzed was associated with an increased risk of developing osteoarthritis of the hip (relative risk [RR] = 1.67 [95% confidence interval (CI), 1.15-2.41]; P =.04), knee (RR = 1.60 [95% CI, 1.23-2.08]; P <.001), and ankle (RR = 7.08 [95% CI, 1.24-40.51]; P =.03) as compared with controls. Meta-analysis suggested a significantly increased likelihood of developing hip osteoarthritis through participating in wrestling (RR = 1.78 [95% CI, 1.20-2.64]; P =.004) and ice hockey (RR = 1.70 [95% CI, 1.27-2.29]; P <.001), while there was no significant difference through participating in handball (RR = 2.50 [95% CI, 0.85-7.36]; P =.10). Likelihood of developing knee osteoarthritis was significantly increased in wrestling (RR = 2.22 [95% CI, 1.59-3.11]) and ice hockey (RR = 1.52 [95% CI, 1.18-1.96]; both P <.002). According to the meta-analysis, shooting did not have a significant effect on the RR of knee osteoarthritis as compared with other sports (RR = 0.43 [95% CI, 0.06-2.99]; P =.39). Conclusion: The likelihood of developing hip and knee osteoarthritis was increased for ice hockey and wrestling athletes, and the risk of developing hip osteoarthritis was increased for handball athletes. The study also found that participation in the sports examined, as a collective, resulted in an increased risk of developing hip, knee, and ankle osteoarthritis.

Brinkman, J. C., et al. (2021). "Epidemiology of Spine Injuries in National Collegiate Athletic Association Men's Wrestling Athletes." Orthopaedic Journal of Sports Medicine **9**(9): 1-7.

Background: Spine injuries are common in collegiate wrestlers and can lead to reinjury, persistent pain, and time lost from participation. Purpose: To describe the epidemiology of spine injuries in National Collegiate Athletic Association (NCAA) wrestlers between academic years 2009 to 2010 and 2013 to 2014. Study Design: Descriptive epidemiology study. Methods: The incidence and characteristics of spine injuries were identified utilizing the NCAA–Injury Surveillance Program database. Spine injuries were assessed for injury type, injury mechanism, time of season, event

type, recurrence, participation restriction, and time lost from participation. Rates of injury were calculated as the number of injuries divided by the total number of athlete-exposures (AEs). Injury rate ratios (IRRs) were calculated for event type and time of season, and results with 95% confidence intervals that did not include 1.0 were considered statistically significant. Results: There were an estimated 2040 spine injuries reported in the database over the 4-year period, resulting in an injury rate of 0.71 per 1000 AEs. Spine injuries were over twice as likely to occur in competitions as in practices (IRR, 2.02; 95% confidence interval, 1.10-3.69). More injuries occurred in both the preseason (0.94 per 1000 AEs) and the postseason (1.12 per 1000 AEs) compared with the regular season (0.55 per 1000 AEs). Contact injuries (42%) were the most common mechanism of injury, and brachial plexus injury (20%) was the most common diagnosis. Only 1.3% of injuries required surgery, and athletes most commonly returned to sport within 24 hours (33%) or within 6 days (25%). Conclusion: This investigation found an overall injury rate of 0.71 per 1000 AEs in wrestling athletes between academic years 2009 to 2010 and 2013 to 2014. The majority of these injuries were new, and athletes most commonly returned to sport within 24 hours. The injury rate was highest in competition, and both the preseason and the postseason showed a higher injury rate than that in season. Efforts to improve injury prevention and management should be informed by these findings.

Burke, L. M., et al. (2021). "ACSM Expert Consensus Statement on Weight Loss in Weight-Category Sports." Current Sports Medicine Reports **20**(4): 199-217.

Weight-category sports are defined by the requirement of a weigh-in before competition to provide performance equity and reduced injury risks by eliminating size discrepancies. Athletes in these sports try to gain a theoretical advantage by competing in weight divisions that are lower than their day-to-day body mass (BM), using a combination of chronic strategies (body-fat losses) and acute manipulations over a period of hours to days before weigh-in ("making weight"). Strategies to support safer practices include minimal competition weight classification based on preseason body composition, reductions in the period between weigh-in and competition, and prohibition of unhealthy weight loss techniques. At an individual level, expert guidance by a sports nutrition professional can help an athlete to establish a pragmatic and long-term approach to BM management, recognizing the nuances of their sport, to achieve favorable outcomes for both health and performance.

Chamishki, D. (2021). "COMPARISON OF RANKING, PREPARATION AND FUNCTIONAL PARAMETERS OF DEAF AND HEARING WRESTLERS FROM THE BULGARIAN NATIONAL GRECO-ROMAN WRESTLING TEAMS." Trakia Journal of Sciences **19**: 565-571.

The successful performance at the competitions of Bulgarian Greco-Roman wrestlers with hearing and deaf is largely due to the adjustment of the training process to the ever-changing rules of Greco-Roman wrestling. Before the London Olympics, because of the rules, the focus was on the speed and strength endurance, but after that only strength endurance as a major factor for sport results. Purpose: Our goal is to compare a world championship results, the methodology of preparation and the functional parameters of wrestlers with impaired and normal hearing in the pre-Olympic year so as to win Olympic quotas. Methods: The analysis involved three best performing Greco-Roman wrestlers at the respective world championships for deaf and hearing athletes in the same year. Results: In addition to sport results and the methodology of preparation, from the functional parameters (physiological and biochemical), we are using the maximum oxygen consumption (VO2max), the maximum oxygen consumption per kilogram (VO2max/kg), the heart rate values and the lactate concentration in the peripheral blood from conducting functional tests. Conclusions: In conclusion, we can say that the sports achievements are in favor of deaf wrestlers, the training methodology is the same and the functional capabilities are better for hearing wrestlers.

Cieśliński, I., et al. (2021). "Identification of success factors in elite wrestlers-An exploratory study." PLoS ONE 16(3): e0247565.

Identification of success factors in wrestling as well as establishing their hierarchy are crucial from a cognitive and practical standpoint. It may provide a lot of practical recommendations related to wrestling-specific training. The aim of this study was to identify and establish the hierarchy of success factors in wrestling regardless of a fighting style and weight class. This study included 168 elite male freestyle and Greco-Roman wrestlers. They were divided into two groups: athletes who won medals (successful wrestlers) in high-rank competitions (Polish Championships or higher) and

those who did not win any medals (less successful wrestlers) in those competitions. The following elements were assessed: anthropological measurements, body composition, dynamic strength, strength endurance, agility, special endurance, wrestling-specific fitness, response time, technical wrestling skills and anaerobic capacity. For initial data analysis, one-way ANOVA ($\alpha = 0.005$) was used. Random Forests classifier was employed to identify success factors and to determine the importance of each of these factors in terms of sports performance. Seven key success factors were identified: anaerobic power, strength endurance, response time, special endurance, wrestling-specific fitness and technical wrestling skills performed in a horizontal position. Random Forests turned out to be an effective method of modelling success in wrestling (compared to SVM and KNN, which were also used in the study). These findings suggest that wrestling-specific training can be effectively monitored by controlling several vital indicators of athletes' preparedness: anaerobic power, strength endurance, response time, special endurance, wrestling-specific fitness and technical wrestling skills (the performance of reverse waistlock from a standing position and trunk grip gut wrench assessed by experts).

Civan, O., et al. (2021). "Evaluation of glenohumeral range of motion and humeral retroversion at ages after major change and differences in wrestlers." Journal of orthopaedic surgery (Hong Kong) **29**(1): 2309499020985149.

Purpose: This study aimed to present the change in humeral retroversion (HR) angle (HRA) that occurs in childhood and young adulthood and the potential developmental difference that is observed in wrestlers.; Methods: HRA of dominant and non-dominant shoulders (DSHRA and NDSHRA, respectively) were measured using ultrasonography in a group of 30 wrestlers who started wrestling before the age of 13 years (Group 1), a group of 30 young adults, aged between 16-20 years, who were not actively engaged in any branch of overhead sports (Group 2) and a group of children aged between 11-13 years and not actively engaged in any branch of overhead sports (Group 3). Range of motion (ROM) degrees of dominant and non-dominant shoulders in all groups were compared within each group and between the groups.; Results: DSHRA (mean: 88.73°, 88.93° and 89.40°) values were significantly higher than NDSHRA (mean: 81.13°, 81.83° and 84.37°) values ($p < 0.001$, $p < 0.001$ and $p < 0,05$) in Groups I, II and III, respectively. Internal rotation and total ROM degrees of the dominant shoulder in Group 1 and 3 were higher than those in Group 2.; Conclusion: There is no significant change in terms of HRA in people aged between 11-13 and 16-20 years because of natural development or wrestling. DSHRA values are higher than NDSHRA ones. In contrast to the shoulders of throwers, the shoulders of wrestlers are characterized by an increase in internal rotation, described as "Wrestler's shoulder."; Level of Evidence: Level III.

Cutrufello, P. T., et al. (2021). "A Comparison of Methods Used to Determine Percent Body Fat, Minimum Wrestling Weight, and Lowest Allowable Weight Class." Journal of strength and conditioning research **35**(3): 633-637.

A comparison of methods used to determine percent body fat, minimum wrestling weight, and lowest allowable weight class. J Strength Cond Res 35(3): 633-637, 2021-The National Collegiate Athletic Association's weight management program allows for the use of skinfold measurements (SF), air displacement plethysmography (ADP), and hydrostatic weighing in the assessment of percent body fat (%BF) and determination of a wrestler's minimum wrestling weight (MWW). Dual energy x-ray absorptiometry (DXA) and ultrasound (US) may offer alternative assessment methods. The purpose of this study was to examine %BF, MWW, and the lowest allowable weight class as determined by SF, ADP, DXA, and US. Thirty-three college-aged men (20.8 ± 1.1 years) participated. Urine specific gravity (Usg) was assessed to ensure proper hydration (1.006 ± 0.006). Percent body fat and MWW were then determined using the 4 assessment methods. Each method was significantly different from one another ($p < 0.05$) with the exception of ADP compared with SF (17.6 ± 7.1% vs. 17.4 ± 6.3%, $p = 1.000$) and DXA compared with US (20.5 ± 6.2% vs. 19.2 ± 7.5%, $p = 0.124$). DXA (68.6 ± 7.1 kg) and US (69.3 ± 6.0 kg) determined the lowest MWW, whereas those determined by SF (70.8 ± 6.8 kg) and ADP (70.9 ± 6.6 kg) were significantly greater ($p< 0.05$). The SEEs for MWW when compared with SF were 3.2, 3.4, and 2.4 kg for ADP, DXA, and US, respectively. Compared with SF, DXA and US would allow wrestlers to certify at a lower weight class 64 and 33% of the time, respectively. When comparing the approved methods (SF and ADP), approximately 50% of subjects would certify at a different weight class depending on the method used. The use of different methods in assessing %BF offer a wide variability in the determination of MWW. (Copyright © 2020 National Strength and Conditioning Association.)

Devrim-Lanpir, A., et al. (2021). "Which Body Density Equations Calculate Body Fat Percentage Better in Olympic Wrestlers?-Comparison Study with Air Displacement Plethysmography." Life (Basel, Switzerland) **11**(7): 707.

> Although skinfold-derived equations seem to be practical for field application in estimating body fat percentage (BF%) and minimum body mass in Olympic wrestlers, prediction equations applied first need to be cross-validated in Olympic wrestlers to define the best prediction equation. This study aimed to evaluate the most accurate field method to predict BF% in Olympic wrestlers compared to BF% estimated by air displacement plethysmography (ADP). Sixty-one male (body mass 72.4 ± 13.5 kg; height 170.3 ± 7.0 cm; body mass index (BMI) 24.9 ± 3.5 kg.m(-2); BF% 8.5 ± 4.9%) and twenty-five female wrestlers (body mass 60.3 ± 9.9 kg; height 161.3 ± 7.1 cm; BMI 23.1 ± 2.5 kg.m(-2); BF% 18.7 ± 4.7%) undertook body composition assessments including ADP and nine-site skinfold measurements. Correlations, bias, limits of agreement, and standardized differences between alterations in BF% measured by ADP and other prediction equations were evaluated to validate measures, and multiple regression analyses to develop an Olympic wrestlers-specific prediction formula. The Stewart and Hannan equation for male wrestlers and the Durnin and Womersley equation for female wrestlers provided the most accurate BF% compared to the measured BF% by ADP, with the lowest bias and presented no significant differences between the measured and predicted BF%. A new prediction equation was developed using only abdominal skinfold and sex as variables, predicting 83.2% of the variance. The findings suggest the use of the new wrestler-specific prediction equation proposed in the study as a valid and accurate alternative to ADP to quantify BF% among Olympic wrestlers.

Dokmanac, M. (2021) PERFORMANCE DATA ANALYSIS OLYMPIC GAMES – TOKYO 2020 OVERVIEW OF THE MOST IMPORTANT TECHNICAL PARAMETERS OF THE TOKYO OLYMPIC GAMES. International Journal of Wrestling Science, 11:1. 3-10.

> This paper presents the most important technical data from the Tokyo 2020 Olympic Games. All this data is available through the "performance data analysis" platform at the internet address http://uww.io/wpar. This analysis provides basic information about the current state of world wrestling. The disadvantage is that this type of analysis has not been done continuously in the past. A comparison with the European championship 2020 was made for the three most important data. It would be best to make a comparison of the last 3 world championships and the last Olympic games.

Drid, P., et al. (2021). "PATTERNS OF RAPID WEIGHT LOSS IN ELITE SAMBO ATHLETES." Journal of Biological Research (1826-8838) **94**: 33-33.

> Rapid weight loss (RWL) is commonly practiced in combat sports. Both magnitude and methods used to induce RWL are largely similar among combat sports, but currently there is no data on RWL methodology used by sambo athletes. Therefore, the aim of this study was to determine RWL procedures sambo athletes apply to lose weight rapidly. The sample consisted of 199 participants, of which 132 males and 67 females who participated in the World Sambo Championship 2020 held in Novi Sad, Serbia. Each participant received a RWL questionnaire that was available in multiple languages, and each participant was instructed how to fill it out. Almost 87% of sambo participants declared to have intentionally cut their weight prior to the competition, whereby 5.27 kg (SD: ±7.57) was lost. Gradual dieting, sauna use and skipping meals were the most dominant methods used to reduce weight prior to competition while more extreme methods of RWL such as the use of laxatives, diuretics, diet pills and vomiting were also implemented but by much smaller fragment of the participants involved. Findings from our study largely match with previously conducted RWL studies in terms of prevalence, magnitude and methods used by combat sport athletes, especially in judo and wrestling. Knowing the hazardous consequences of RWL, alternative methods of sustainable weight loss should be considered.

Egorov, N. A., et al. (2021). "Analiz rezul'tatov kardiorespiratornogo nagruzocnogo testirovanija sportsmenov-edinoborcev v 30-letnej retrospektive. [ANALYSIS OF THE RESULTS OF CARDIORESPIRATORY LOAD TESTING OF WRESTLERS IN 30-YEAR RETROSPECTIVE]" Vestnik sportivnoj nauki; Sports science bulletin(2): 4-9.

Indicators of aerobic operability of 344 male athletes engaged in wrestling, obtained with the help of cardiorespiratory load testing are analyzed. Comparative analysis of the obtained results was carried out with similar data in a 30-year retrospective. The results obtained over the last 10 years differ from used standards developed in 1988. As a result of carried out studies scales intended for assessment of level of aerobic capabilities of wrestlers at peak of load and at the level of PANO were developed. Scales provide gradation on 7 qualitative levels (very high, high, above an average, average, below an average, low and very low) during peak of physical activity, and on 5 qualitative levels (high, above an average, average, below an average and low) at achievement of AT. The athletes` assignment to one of these levels is determined on the basis of values of 4 indicators of aerobic capabilities (O2 uptake, CO2 emission, oxygen pulse, heart rate) obtained from the results of cardiorespiratory load testing.

Ferranti, S., et al. (2021). "The Epidemiology of Concussion in Middle School Wrestling." <u>Archives of Clinical Neuropsychology</u> **36**(4): 649-649.

Objective Wrestling has among the highest concussion incidence in all high school and collegiate sports. Many children begin wrestling in middle school (MS), however, research describing concussion incidence in MS wrestling remains limited. Therefore, we sought to describe the incidence of concussion and subsequent sport time loss (TL) sustained by MS wrestlers. Methods Certified athletic trainers collected concussion and athlete exposure (AE) data for all MS wrestling practices and matches in a large metropolitan public-school division between 2015/16 and 2019/20. AE was defined as one athlete participating in one practice or match. Frequencies and proportions were calculated for diagnosed concussions by event type. TL was the number of days from date of injury to return to sport. Concussion injury rates (IR) per 1000 AEs and injury rate ratios (IRR) to compare IR between practice and matches were calculated with 95% Confidence Intervals (CIs). IRRs with 95% CIs excluding 1.0 were statistically significant. Results 43 concussions occurred across 38,297 AEs (IR = 1.12, 95%CI = 0.79–1.46). No significant difference in the concussion IR between practices (n = 33, IR = 1.11, 95%CI = 0.73–1.49) and matches (n = 10, IR = 1.16, CI = 0.44–1.87; IRR = 1.04, 95% CI = 0.51–2.11) was observed. The mean TL was 18.38 ± 8.25 days. Conclusions We observed higher practice and match concussion rates than those previously reported among middle and high school wrestlers. Additionally, our findings showed that MS wrestlers required approximately 5 more days to return to sport than reported among HS wrestlers. Further investigation of concussion risk factors for concussion and prolonged TL in MS wrestling is needed.

Franchini, E. (2021). FUTURE ISSUES IN WRESTLING RESEARCH - A SPORT SCIENCES PERSPECTIVE. *International Journal of Wrestling Science;* Vol 11 Issue 2; 2-7*.*

The main goals of the present article is to provide an overview of sport sciences wrestling-related research, and to present topics that deserve information. While the first goal can be achieved via a more formal and objective way, the second is based on the experience of the author and should be taken with caution.

Franchini, E. and T. Herrera-Valenzuela (Eds) (2021). "Special Issue: Strength and conditioning for combat sports athletes Revista de Artes Marciales Asiáticas." <u>Revista de Artes Marciales Asiaticas</u> **16**: 1-203. Volume 16(1s) ~ 2021 ~ DOI: 10.18002/rama.v16i1s Strength and conditioning for combat sports athletes

Guellich, A., et al. (2021). "What Makes a Champion? Early Multidisciplinary Practice, Not Early Specialization, Predicts World-Class Performance." <u>Perspectives on Psychological Science</u>: 174569162097477.

What explains the acquisition of exceptional human performance? Does a focus on intensive specialized practice facilitate excellence, or is a multidisciplinary practice background better? We investigated this question in sports. Our meta-analysis involved 51 international study reports with 477 effect sizes from 6,096 athletes, including 772 of the world's top performers. Predictor variables included starting age, age of reaching defined performance milestones, and amounts of coach-led practice and youth-led play (e.g., pickup games) in the athlete's respective main sport and in other sports. Analyses revealed that (a) adult world-class athletes engaged in more childhood/adolescent multisport practice, started their main sport later, accumulated less main-sport practice, and initially

progressed more slowly than did national-class athletes; (b) higher performing youth athletes started playing their main sport earlier, engaged in more main-sport practice but less other-sports practice, and had faster initial progress than did lower performing youth athletes; and (c) youth-led play in any sport had negligible effects on both youth and adult performance. We illustrate parallels from science: Nobel laureates had multidisciplinary study/working experience and slower early progress than did national-level award winners. The findings suggest that variable, multidisciplinary practice experiences are associated with gradual initial discipline-specific progress but greater sustainability of long-term development of excellence.

Hoge, C., et al. (2021). "Rising Trends in Wrestling-associated Injuries in Females Presenting to US Emergency Departments." Western Journal of Emergency Medicine: Integrating Emergency Care with Population Health **22**(2): 410-416.

Introduction: Wrestling is one of the fastest-growing sports among females in the United States (US). However, female wrestling injuries remain poorly characterized. In this study we describe historical and projected national estimates of female wrestling injuries, and compare injury characteristics with those of male wrestlers. Methods: We queried the National Electronic Injury Surveillance System (NEISS) database (2005- 2019) to compare national weighted estimates and injury characteristics of male vs female wrestlers presenting to US emergency departments (ED) and projected annual female wrestling injuries expected by 2030. Results: Our analyses demonstrated a significant (P < 0.001) increase in female wrestling injuries between 2005 (N = 1500; confidence interval [CI], 923 - 2,078) and 2019 (N = 3,404; CI 2,296 - 4,513). Linear regression (R2 = 0.69; P < 0.001) projected 4,558 (CI, 3104 - 6033) such injuries in 2030. Of female wrestling injuries 50.1% (CI, 44.1 - 56.2) occurred in patients 14-18 years of age. Compared with age-matched males, female wrestlers were significantly less likely to present with fractures (Female [F]: 10.6%; CI 7.5% - 13.7%; Male [M]: 15.7%; CI 14.7% - 16.7%; P = 0.003) or head/neck injuries (F: 18.5%; CI 13.2% - 23.9%; M: 24.6%; CI 23.2% - 26.0%; P = 0.018), and significantly more likely to present with strains/sprains (F: 48.8%; CI, 41.2% - 56.3%; M: 34.4%; CI 31.6% - 37.1%; P < 0.001). Conclusion: Males and females possess distinctly unique physiology and anatomy, such as variances in ligamentous and muscular strength, which may help to explain differences in wrestling injury characteristics. Prompt management of injuries and specific training strategies aimed at prevention may help to reduce the projected increase of female wrestling-associated injuries as the popularity of the sport continues to rise.

Holder, J., Smith, DM, France, TJ (2021). "Coaching Leadership Behaviors: A Comparison of High School and Collegiate Wrestling Coaches." Sport Journal: 17 pages

Purpose: In this study, we compared the coaching behaviors and leadership styles of high school and collegiate (NCAA Division III) head wrestling coaches.
Methods: To assess student-athletes' perceptions of their coaches' behaviors, the Coaching Behavior Scale for Sport (CBS-S) was administered to high school (n = 77) and collegiate (n = 62) student-athletes at three times over the wrestling season (preseason, midseason, postseason). To assess coaches' self-perceived leadership styles, the Leadership Scale for Sport (LSS) was administered one time to high school (n = 24) and collegiate (n = 24) head wrestling coaches.
Results: Significant increases across the season were indicated for the CBS-S subscales of physical training and conditioning, mental preparation, goal setting, competition strategies, and positive rapport. For the CBS-S subscales of technical skills and competition strategies, high school head coaches scored significantly higher than collegiate coaches. There were no significant differences in LSS subscale scores when comparing high school and collegiate coaches.
Conclusions: The findings of the current study can be useful in identifying the multiple factors involved in successful coaching. They could prove helpful for increasing coaches' awareness of high school and collegiate student-athlete perceptions of coaching behaviors throughout three different time points of the season.
Applications in Sport: The results provide an opportunity for coaches to improve in areas where coaches of their particular level (high school, collegiate) are lacking and use this feedback to gauge their own coaching behaviors and leadership styles.

Kara, E., et al. (2021). "Relationship between functional movement screening and static balance scores: Increasing the educational level of elite female wrestlers." Propósitos y Representaciones. Journal of Educational Psychology.

The importance of balance is considerably high in many sports that require struggle and close contact such as wrestling. Some losses in maintaining the balance due to the movements requiring high intensity during competitions and increase in the risk of injury due to these losses may occur in wrestling athletes. The aim of this study is to Increase the educational level of elite female wrestlers by examining the relationship between Functional Movement Screening Test Scores and static balance performance scores of elite young female wrestlers. 19 elite female wrestlers having average age of 22.94 ± 2.67 years, body weight 61.63 ± 7.25 kg, height 165.37 ± 5.17 cm and BMI 22.46 ± 1.60kg / m2 participated in the study. Functional Movement Screen Test ™ (FMST™) battery was used in determining the functional movements of the participants, while Tecnobody Prokin 200 Bergamo/Italy was used to determine the total postural stability index values. All static balance measurements were evaluated as standing Double-Leg Eyes Open (DLEO), Eyes Open Single-Leg Dominant Non-Dominant (EOSL-DM and EOSL-ND). Since higher stability index values indicate lower stability, the participants were found to have a negative correlation between non-dominant leg static balance and HS. SM. and TSPU, and between dominant leg static balance and HS. SM. and TSPU. In addition, it was found out that, there was a negative correlation between non-dominant leg static balance, dominant leg static balance and double leg static balance and the FMST™ scores of the participants. The results of this research can be very effective in improving the educational process in the field of wrestling.

Karelin, A. A., et al. (2021). "Women`s freestyle wrestling in global sports movement: progress analysis." Theory and Practice of Physical Culture(10): 3-5.

Objective of the study was to analyze modern women`s freestyle wrestling progress trends in the context of the global sports movement history based on the statistics of the Women's World Wrestling Championships. Results and conclusion. The Women's World Wrestling Championships statistics analysis for the whole Women's World Wrestling Championships period (31 events on the whole) shows only six nations leading in the team standings, with 24 events won by Japan women`s freestyle wrestling team (77.4% of the total); followed by Russia and China (2 won events); and the USA, Norway and Azerbaijan (1 event each). The analysis demonstrates, on the one hand, the colossal superiority of the Japan women`s freestyle wrestling team and, on the other hand, a very tough competition of the other leading nations. Having summarized and analyzed the women`s freestyle wrestling progress data in the context of the global sports movement, we would emphasize that the constantly growing competitiveness of the Women's World Wrestling Championship with the fast growths in numbers of individual elite competitors and competing national teams are the key factors indicative of the rapidly increasing popularity of the modern women`s freestyle wrestling sport that is clearly on a fast progress path nowadays.

Kondo, E., et al. (2021). "The link between the range of rapid weight loss and physical conditions of elite wrestlers during competition under the morning weigh-in rule." The Journal of sports medicine and physical fitness **61**(1): 117-123.

Background: Amateur wrestlers have often undergone rapid weight loss (RWL) to win their matches. On January 1, 2018, the rule of weigh-in was changed and weight category increased. The study aimed to determine the prevalence of wrestlers undergoing RWL under the new rule of morning weigh-in before the tournament and examine the relationship between the range of RWL and physical conditions.; Methods: Male (N.=204) and female (N.=50) wrestlers participating in the National Wrestling Championship completed a questionnaire about weight reduction methods and their physical condition.; Results: Among 159 participants exceeding their weight class one-week before competition, 36% of males and 44% of females exceeded their weight class by 0.0-4.9% (requiring small RWL); 30% of males and 6% of females exceeded by 5.0-10.0% (requiring large RWL), but neither males nor females were over 10.0% above required weight. In males, there was a moderate negative correlation between excess rates of body mass one-week before competition and their physical condition (r=-0.330 to -0.467, P<0.05) on the first day of the competition; however, no significant correlation was found in the females. Comparing physical condition according to the range of RWL, there were significantly lower scores in the large RWL group (≥4.9%) than the small RWL group (<4.9%) in males.; Conclusions: We found that RWL≤5% is most appropriate to ensure better physical condition of wrestlers on competition day.

Kondo, E., et al. (2021). "Effects of an overnight high-carbohydrate meal on muscle glycogen after rapid weight loss in male collegiate wrestlers." <u>BMC Sports Science, Medicine and Rehabilitation</u> **13**.

Background Severe rapid weight loss (RWL) induces a decrease in muscle glycogen (mGly). Nevertheless, adequate carbohydrate intake after RWL has not been reported to optimize muscle glycogen following a weigh-in the evening until a wrestling tournament morning. The purpose of this study was to investigate the effect of an overnight high-carbohydrate recovery meal of 7.1 g kg^{-1} following RWL on mGly concentration. Methods Ten male elite wrestlers lost 6% of their body mass within 53 h and then subsequently ate three meals, within 5 h, containing total of 7.1 g kg^{-1} of carbohydrates. mGly was measured by ^{13}C-magnetic resonance spectroscopy before (BL) and after RWL (R0) at 2 h (R2), 4 h (R4), and 13 h (R13) after initiating the meal. Body composition, muscle cross-sectional area, and blood and urine samples were collected at BL, R0, and R13. Results Body mass decreased by 4.6 ± 0.6 kg ($p < 0.05$) and did not recover to BL levels in R13 ($- 1.7 ± 0.6$ kg, $p < 0.05$). Likewise, mGly by 36.5% ± 10.0% ($p < 0.05$) and then did not reach BL levels by R13 ($p < 0.05$). Conclusion A high-carbohydrate meal of 7.1 g kg^{-1} after 6% RWL was not sufficient to recover mGly during a 13 h recovery phase. Participating in high-intensity wrestling matches with an mGly concentration below normal levels is maybe undesirable.

Korolev, D. S., et al. (2021). "Characteristics of Changes in Hematological and Biochemical Parameters of Wrestling Athletes." <u>Human Physiology</u> **47**(5): 558-563.

Hematological and biochemical blood parameters indicate both the degree of adaptation of the body of athletes to physical activity and the imbalance between body's adaptation capabilities and the loads imposed. This study investigates the balance of hematological and biochemical blood indicators in professional wrestlers (sambo, freestyle wrestling, and Greco-Roman wrestling). Sambo wrestlers were characterized by the highest counts of peripheral blood leukocytes. All wrestlers had higher counts of monocytes and granulocytes compared to the control group. Athletes specializing in freestyle and Greco-Roman wrestling had the highest blood hemoglobin values due to the increased average hemoglobin content in erythrocyte. Subjects of the control group had the smallest platelet count. The groups also exhibited differences in the shape and size of blood cells. The groups did not differ in the blood contents of transferases (ALT and ACT), while all athletes had higher levels of alkaline phosphatase. Wrestlers were characterized by a higher content of blood triglycerides, while cholesterol levels did not differ significantly between the groups. Sambo wrestlers had the highest level of creatinine. Testosterone content in athletes was lower than in the control group; this decrease was the least in freestyle wrestlers. The contents of cortisol, T4, and TSH in athletes were higher than in the control group. At the same time, wrestlers had reduced levels of T3, testosterone, and vitamin D. All these results suggested that physical loads were inadequate to the body's adaptive capabilities and/or that physical activity and nutrient intake were not balanced.

Kostorz, K. and K. Sas-Nowosielski (2021). "Aggression Dimensions Among Athletes Practising Martial Arts and Combat Sports." <u>Frontiers in Psychology</u> **12**: 696943-696943.

Purpose: The main aim of the research was to analyse aggression dimensions among athletes practising martial arts and combat sports. Material and Methods: There were 219 respondents. The Buss and Perry Aggression Questionnaire (BPAQ) in the Polish adaptation by Siekierka was applied. Results: Martial arts apprentices turned out to present a statistically significantly lower level of hostility ($p < 0.001$) and of the general aggression index ($p = 0.04$) than combat sports athletes. It turned out that lower level of aggression was noted in female participants (physical aggression ($p < 0.001$), verbal aggression ($p = 0.004$), hostility ($p < 0.001$), and the general aggression index ($p < 0.001$). Analysis revealed that the training experience and the training rank did not differentiat the level of the respondents' particular aggression dimensions. Conclusions: It would be advisable to perform parallel analyses in other areas of Poland and take into account the respondents' education and place of residence.

Latyshev, M., et al. (2021). "Age distribution of wrestlers participating in the world championships." <u>Acta Kinesiologica</u> **15**(1): 138-143.

The age of peak competitive performance is particularly important as the entire sports career in each sport is planned on its basis. Depending on the sport and gender of the athlete, the age of peak competitive performance varies considerably. The objective of the study -to determine the age

indicators of the wrestlers who participated in the World Championships, depending on the place taken and the weight group. We have studied 332 sports careers of the freestyle and Greco-Roman male wrestlers from 1st to 8th ranks who participated in the World Championships 2017, 2018 and 2019. The following indicators are analyzed: the average age, the average age of the international career start, the average age of first success and the proportion of athletes who achieved success at junior level. Results. The average age of the wrestlers is 26.5 ± 3.6 years: the medalists are slightly younger -26.3 ± 3.4 years, and non-medalists are older than 26.7 ± 3.8 years. The analysis of the distribution of the age of peak competitive performance of athletes-medalists has shown the following results: there are 67.7 % of medalist among the athletes who are 22-28 years old, 11.8% among those who are younger than 23 years old and only 26.6% among those who are older than 28 years. More than half (53.4%) of medalists achieved success being juniors, while for non-medalists this proportion is only 38.2%. The linear regression coefficient between the age and the weight of athletes is positive and is equal to 0.47 kg per year. The results obtained on the medalists show that the period for achieving the peak competitive performance is limited and quite a few athletes can succeed beyond a certain period of age.

Lambert, C. P. (2021). Physiology and nutrition for amateur wrestling. Boca Raton, CRC Press.

Physiology and Nutrition for Amateur Wrestling is essential reading for amateur wrestlers and their coaches with a desire to learn about physiological training and nutrition for their sport. Written by Charles Paul Lambert, PhD, a competitive wrestler and academic expert in high-intensity exercise, this book describes the primary physiological systems involved in amateur wrestling. Readers will learn how to substantially optimize performance and discover ways to improve body composition specific to the sport of amateur wrestling. The book addresses important issues, including relative energy deficiency in sport, debates around weight loss, the specificities of training and nutrition for female wrestlers, as well as strategies on keeping fit in the years after a competitive career. Features: Discusses strategies for monitoring overall training load to prevent overtraining and optimize training Includes optimal nutritional fueling plans for wrestlers written by a Certified Coach with USA Wrestling and compares different dietary approaches to losing weight and fat Provides optimal rehydration and refueling plans based on situational needs in the post-weigh-in period Both scientific and practical, Physiology and Nutrition for Amateur Wrestling will appeal to wrestlers, high-school and college coaches, and those working in applied physiology research and exercise science. Table of Contents 1. Introduction: Philosophy behind this book: Physiology and Nutrition for Amateur Wrestling 2. Positive Physiological Benefits of Wrestling Part 1. Physiological Basis for Wrestling 3. Skeletal Muscle 4. The Nervous System 5. The Cardiovascular System 6. The Gastrointestinal Tract 7. The Endocrine System 8. Muscle Fibre Types 9. Fuel Selection During a Wrestling Match 10. Energy Systems and Biochemical Causes of Fatigue 11. Physiological Factors that allow for the attainment of "Maximal Power Output" and "Entire Match Wrestling Power Output" 12. Cardiovascular Adaptations to Endurance Exercise Training 13. Training Variables 14. Training Strategies for Wrestling 15. Periodization (Structure of weeks and months of training) 16. Physiological Assessment and Detection of Overtraining Part 2. Nutrition for Amateur Wrestling: Fuelling the Machine 17. Amateur Wrestling Nutrition and Metabolism Primer 18. Water Balance, Electrolyte Balance, and Hydration, Hydration Testing, Body Composition Testing, and Mandated Weight Control 19. The Case against Rapid Weight Loss 20. Optimizing Physique and Body Composition and Determining the Appropriate Weight Category 21. Optimal Nutrition for Maintenance of Body Composition and for Fueling Training during the Season 22. Nutrition for a Single Match, a One Day Tournament, and a Multiple Day Tournament 23. What and how should the Wrestler Eat and Drink Post-Weigh In 24. Dietary Supplement use in Wrestlers 25. Relative Energy Deficiency in Sport 26. Special Considerations for the Female Wrestler 27. Weight Control and Physical Fitness in the Years after the Wrestler's Competitive Career

Lee, K.-L., et al. (2021). "Correlation between muscle architecture and anaerobic power in athletes involved in different sports." Scientific Reports **11**(13332): 1-8.

Athletes cultivate highly developed muscles based on their sport category, creating a body shape that matches the characteristics of that sports category. We tested the significance of the correlation between muscle development characteristics and anaerobic power in athletes to build a database for each category. Fifty-eight college athletes participated in this study. To assess muscle characteristics, muscle thickness (MT) and fascicle angle (FA) were measured by ultrasonography (US) in lower limb. Furthermore, anaerobic power was measured with the Wingate test. Analysis of the correlation between muscle structure and anaerobic power revealed significant differences

between the sports categories, except for the MT of the medial head of gastrocnemius (Gm), lateral head of gastrocnemius, and FA of Gm. A significant difference was observed for all parameters, except for the arrival time to peak power in the anaerobic power items; in particular, a high degree of correlation in mean power/kg and peak power/kg was observed. A similar tendency was observed in the correlation between muscle structure and anaerobic power in most sports categories, but certain muscle characteristic factors were prominent in each sport. Based on these, it is possible to contribute to predicting and promoting athletic performance.

Lystad, R. P., et al. (2021). "Injury incidence, severity and profile in Olympic combat sports: a comparative analysis of 7712 athlete exposures from three consecutive Olympic Games." British Journal of Sports Medicine **55**(19): 1077-1083.

Objectives: To describe and compare the epidemiology of competition injuries in unarmed combat sports (ie, boxing, judo, taekwondo and wrestling) in three consecutive Olympic Games. Methods: Prospective cohort study using injury data from the IOC injury surveillance system and exposure data from official tournament records at three consecutive Olympic Games (ie, Beijing 2008, London 2012 and Rio de Janeiro 2016). Competition injury incidence rates per 1000 min of exposure (IIRME) were calculated with 95% CIs using standard formulae for Poisson rates. Results: The overall IIRME was 7.8 (95% CI 7.0 to 8.7). The IIRME in judo (9.6 (95% CI 7.8 to 11.7)), boxing (9.2 (95% CI 7.6 to 10.9)) and taekwondo (7.7 (95% CI 5.6 to 10.5)) were significantly higher than in wrestling (4.8 (95% CI 3.6 to 6.2)). The proportion of injuries resulting in >7 days absence from competition or training was higher in wrestling (39.6%), judo (35.9%) and taekwondo (32.5%) than in boxing (21.0%). There was no difference in injury risk by sex, weight category or tournament round, but athletes that lost had significantly higher IIRME compared with their winning opponents (rate ratio 3.59 (95% CI 2.68 to 4.79)). Conclusion: Olympic combat sport athletes sustained, on average, one injury every 2.1 hours of competition. The risk of injury was significantly higher in boxing, judo and taekwondo than in wrestling. About 30% of injuries sustained during competition resulted in >7 days absence from competition or training. There is a need for identifying modifiable risk factors for injury in Olympic combat sports, which in turn can be targeted by injury prevention initiatives to reduce the burden of injury among combat sport athletes.

Makaveev, R. (2021). "DEVELOPMENT OF A STRATEGY FOR THE PROGRESS OF SPORTS WRESTLING IN BULGARIA." Trakia Journal of Sciences **19**(Suppl. 1): 502-506.

Looking at the rankings of the European Championships, World Championships and Olympic Games of Bulgarian wrestlers in recent years, we find that they are greatly reduced compared to the performances before 1991. Purpose: analyzing these facts we found a lack of strategic thinking and planning. We set a goal to develop a strategy for the progress of wrestling in the Republic of Bulgaria. Methods: literature research, document analysis, theoretical and logical analysis. Results: the development of a strategy implies thinking in perspective at least 30 years ahead in time. The program formed in this way is only a prerequisite for the development of sport, as there are many conventions that would affect its effectiveness. Discussion: the development of sport in general and wrestling in particular is impossible without strategic planning and the resulting requirements. The implementation of activities under this strategy requires support and long-term commitment from the country. Conclusion: the presented program includes many activities in different directions. The ultimate goal, namely to restore the positions of the Bulgarian struggle on the world carpet, requires solving all specific tasks.

Marković, M., et al. (2021). "Validity of a Novel Specific Wrestling Fitness Test." Journal of strength and conditioning research **35**(Suppl 2): S51-S57.

The specific wrestling fitness test (SWFT) is a novel test aiming to estimate the level of physical preparedness of wrestlers; therefore, it should possess an acceptable level of validity. The aim of this study was to investigate an internal, external, and construct validity of SWFT. The sample consisted of 15 national level male wrestlers (age = 22.6 ± 2.3 years, body mass [BM] = 83.3 ± 6.5 kg, and BM index [BMI] = 25.36 ± 1.2 kg·m-2). They performed the SWFT, specific judo fitness test (SJFT), and specific wrestling performance test (SWPT), each test on a separate day. For each test, performance was evaluated in absolute measure as total number of throws at the end of the test (TnThrows) and relative measure as TnThrows/BM and TnThrows/BMI. Heart rate at the end of the test (HR0min) and 1 minute into recovery (HR1min) was used as a measure of cardiovascular

functionality, whereas specific judo fitness index (SJFIndex) was used as an indicator of cardiovascular functionality relative to given performance. A correlation and multiple linear regression analyses were used to investigate the internal, external, and construct validity of SWFT. The SWFT_TnThrows/BM had the highest internal validity relative to SJFT_TnThrows/BM ($R2 = 0.722$, $p < 0.001$) and the highest external validity relative to SWPT_TnThrows/BM ($r = 0.846$, $p < 0.001$). SWFT_TnThrows/BM predicted SWPT_TnThrows/BM with a large coefficient of determination ($R2 = 0.818$, $p < 0.001$). SWFT_TnThrows/BM is valid and easily attainable predictor of wrestlers' specific physical preparedness and as such is of high practical value. (Copyright © 2020 National Strength and Conditioning Association.)

Min, S. K., et al. (2021). "The ACTN3 R577Xgth in Korea national combat athletes." <u>Science & Sports</u> **36**.

The aim of the present study is the investigation of the association between the ACTN3 genotype and the grip strength according to measurements in Korea National combats athletes. Fifty-six Korea National combats athletes (Judo and wrestling, male = 38, female = 18) and two hundred and twenty-one control group of normal populations (male = 135, female = 86) were recruited for the present study. The variables under examination were body composition, Wingate anaerobic test, and handgrip strength. Genotyping for the ACTN3 (rs 1815739) polymorphism was performed using the TaqMan approach. ACTN3 gene distribution of subjects was in the Hardy–Weinberg equilibrium (athletes: $P = 0.175$; control: $P = 0.508$). The relative power drop ($P = 0.041$) differed significantly among the ACTN3 genotypes, and non-significant differences in peak power and average power. The relative left hand grip strength in male ($P = 0.004$) differed significantly between the ACTN3 R allele. However, non-significant differences right hand grip strength in male and both hand grip strength in female. We found a positive relationship between the ACTN3 R577X genotypes and the relative left hand grip strength in male Korean National combat athletes. Our data indicate that the ACTN3 R allele (RR and RX genotypes) is associated with muscle strength output capacity.

Miranda, K. A., et al. (2021). "Effects of gradual weight loss on strength levels and body composition in wrestlers athletes." <u>The Journal of sports medicine and physical fitness</u> **61**(3): 401-406.

BACKGROUND: Few investigations have evaluated isokinetic torque after a period of weight loss in wrestlers. Thus, the current study sought to investigate the effects of gradual weight loss in the precompetitive period on isokinetic peak torque in the upper and lower limbs and body composition in wrestling athletes. METHODS: Eight elite athletes participated in the study (mean age 20.8±3.1 years). The athletes visited the laboratory on 2 occasions: during the period of weight maintenance (baseline) and during weight loss, in the precompetitive period (post). The variables analyzed were body composition through air displacement plethysmography (BOD POD) and peak torque (PT) of knee flexion and extension movements, and internal and external shoulder rotation in concentric action, at speeds of 60°/s and 180°/s, determined using an isokinetic dynamometer (Biodex Medical Systems; Shirley, NY, USA). RESULTS: A significant decrease was observed in body composition values, except lean mass. No significant differences were observed in the PT of the movements analyzed: Shoulder internal rotation (60°/s $P=0.825$; 180°/s $P=0.245$) and external rotation (60°/s $P=0.149$; 180°/s $P=0.163$) and knee extension (60°/s $P=0.086$; 180°/s $P=0.630$) and flexion (60°/s $P=0.310$; 180°/s $P=0.239$). CONCLUSIONS: Gradual weight loss did not affect the production of torque in the wrestlers before a competition. In addition, gradual weight loss contributed to a reduction in body fat, associated with an increase in percentage lean body mass.

Mirzaei, B. (2021) DEVELOPMENT OF THE ELITE WRESTLING ATHLETE. International Journal of Wrestling Science, 11(1): 11-18.

There is not a simple singular uniform approach to the topic such as the "Development of the Elite Wrestling Athlete" because of many cultural differences among countries. So, the way to success is not the same for all wrestlers.

Wrestlers' development model from novice to elite level is a long-term process with different systems among countries. In the most countries, the systems are based upon club development with a primary singular coach involved in the young athlete's development, focusing on the international styles of Freestyle and Greco-Roman Wrestling. Whereas, in the USA it is based upon folkstyle wrestling within the school system, from middle school to the university level with a multitude of coaches involved.

Mirzaei et al. (2013) in a comparative study of starting age of training, training background, sport achievement and performance consistency of 800 elite wrestlers in the seven world famous countries including: Russia, Iran, USA, Cuba, Turkey, Georgia and Ukraine who won medals in international competitions since 1960s reported that there are significant differences between all above-mentioned variables among top wrestling countries (3).

These days, the advancement of the science and technology has made it possible for many countries to invest in training successful athletes to succeed in international sporting events. One of the most remarkable among these investments is in talent selection. Being talented is a way to succeed in sports. Therefore, talent selection is very important for the identification of future champions.

Reaching the top level and becoming a national team member will occur only in a very small percentage of those athletes that start into the sport of wrestling. So, it is important to be able to identify those talented wrestlers as early as possible and nurture and encourage them in their development. Most sport clubs, coaches and professional teams use talent tests to identify talented athletes. The concept of talent in sports can be defined as all of the characteristics such as genetic factors, intrinsic physical and physiological capacity, psychological strengths, mental toughness or " grit " and high performance that are thought to be effective for a person to succeed in sports (1).

Nardini, D. and A. Épron (2021). "Being Breton through wrestling: Traditional gouren as a distinctive Breton activity." Ethnography **22**(3): 372-395.

Gouren is a style of wrestling practiced in Brittany, France. It has been "sportised" during the last century, but it still represents an emblematic tradition for those people involved who exploit its ancient origins to describe it as a distinctive Breton activity. Following the same path of Breton "identity"—one that has been defined in opposition to hegemonic French identity—gouren is largely defined by its practitioners in opposition to the "hegemonic" wrestling style in France, judo, viewed as an epitome of globalized sports. Through their actions and narratives, Breton wrestlers shape an alternative (pre-modern) sporting culture, promoting non-aggressive, social, and non-hierarchical attitudes over radical competition, athletic performance and personal achievement. Accordingly, gouren is associated with "old-fashioned" ideas of masculinity, strength and related values, that serve to root the practice in the idealized past of Brittany—even now that women are actively involved in gouren.

Nardini, D. and G. Scandurra (2021). "'Hand-to-hand sports and the struggle for belonging'." Ethnography **22**(3): 289-294.

This special issue on hand-to-hand sports aims to analyse how collective identities and forms of group and community belonging are defined, strengthened, built, imagined or even denied in the sportive and social contexts in which hand-to-hand combat or wrestling disciplines are practised. Considering the wide-ranging cross-cultural distribution of combat and wrestling practices in very different cultures and societies across the contemporary world, this issue intends to provide a (not-exhaustive) comparison of practices originating in highly heterogeneous geographical, social and cultural contexts. Indeed, comparisons focus on specific practices (combat and wrestling activities) and their relationship with belonging. The contributing scholars have studied and reflected on a particular style of wrestling or combat practice and its links to social belonging and identity, whether it be expressed on regional or national, local or global, social or ethnic, institutional or 'counter-cultural', symbolic or concrete levels.

Pierpoint, L. A. and C. Collins (2021). "Epidemiology of Sport-Related Concussion." Clinics in sports medicine **40**(1): 1-18.

Sport-related concussions are common in the United States. Concussion rates have increased over time, likely due to improved recognition and awareness. Concussion rates vary across level (high school vs college), sex, and sport. Concussion rates are the highest among men, particularly in football, wrestling, ice hockey, and lacrosse where collisions and contact are inherent to the sports, although girls'/women's soccer rates are high. In gender-comparable sports, women have higher

concussion rates. Continued data collection will increase understanding of sport-related concussion and provide areas for targeted prevention in the future.

Pirruccio, K., et al. (2021). "Wrestling-related concussions and closed head injuries predominantly occur in high school age athletes." The Journal of sports medicine and physical fitness **61**(3): 407-412.

Background: Sports-related concussions (SRC) and closed head injuries (CHI) have recently garnered national attention given mounting concern for long-term neurological sequelae resulting from repetitive head trauma. Despite historically dangerous techniques in wrestling that involve impacts to the head, there is a paucity of epidemiologic data in regard to wrestling-related concussions (WRCs) in the United States (USA).; Methods: The National Electronic Injury Surveillance System (NEISS) database was queried (2000-2018) to report national estimates and demographic characteristics of patients 6-25 years of age presenting to US emergency departments (EDs) with WRCs and CHIs.; Results: The average annual number of patients presenting to US EDs with WRCs or CHIs was 3465 (95% confidence interval [CI]: 2489-4441). Over one-third of patients were between 15 (17.7%; 95% CI: 15.8%-19.7%) and 16 (17.0%; 95% CI: 14.9%-19.1%) years of age, which comprised the peak age groups during which such head injuries were sustained. The vast majority of patients were male (96.3%; 95% CI: 94.8%-97.7%). Lastly, 6.2% (95% CI: 4.3-8.2%) of patients did not present to the ED on the same day that the injury was sustained.; Conclusions: Due to the unique nature and culture of the sport, wrestlers may be more likely to attribute SRC or CHI symptoms to normal training-related fatigue, which can lead to underreporting or delayed diagnosis. It is therefore imperative that appropriate safety initiatives and concussion awareness campaigns be implemented in youth wrestling to decrease the incidence of SRCs at local and national levels.

Podlivaev BA, Kurashvili VA, Gaiduk AA. (2021) ORTHOPEDIC EXAMINATION OF JUNIOR FEMALE WRESTLERS: A CASE STUDY. International Journal of Wrestling Science 11 (1): 19-24.

Background: The aim of this study was to investigate the possible influence of female wrestling on the musculoskeletal system of junior female wrestlers. Method: The study involved 16 freestyle junior female wrestlers. Orthopedic examination was carried out by optical topography Formetric 4D measurements.
Results: Of the 16 subjects of the sample, 12 children were orthopedically normal, 3 patients had false scoliosis and 1 has adolescent idiopathic scoliosis (AIS). The results obtained revealed that contralateral side of deviation of the curve of the spine in subjects with scoliosis is statistically significant (p = 0.002). Furthermore, the relationship between lower midline and contralateral side of deviation of the curve of the spine in patients with false scoliosis is statistically significant (p = 0.003). Conclusions: The Formetric 4D provides a safe method to monitor and track the progression of postural deformities in young athletes. It can be reliably used in the surveillance of patients with AIS.

Powell, J. R., et al. (2021). "Epidemiology of Injuries in National Collegiate Athletic Association Men's Wrestling: 2014-2015 Through 2018-2019." Journal of athletic training **56**(7): 727-733.

Context: The first men's wrestling National Collegiate Athletic Association (NCAA) Championship was sponsored in 1928; since then, participation has increased.; Background: Continued study of wrestling injury data is essential to identify areas for intervention based on emerging trends.; Methods: Exposure and injury data collected in the NCAA Injury Surveillance Program during 2014-2015 through 2018-2019 were analyzed. Injury counts, rates, and proportions were used to describe injury characteristics, and injury rate ratios (IRRs) were used to examine differential injury rates.; Results: The overall injury rate was 8.82 per 1000 athlete exposures. The competition injury rate was significantly higher than practice injury rate (IRR = 4.11; 95% CI = 3.72, 4.55). The most commonly injured body parts were the knee (21.4%), shoulder (13.4%), and head/face (13.3%), and the most prevalently reported specific injury was concussion.; Summary: These findings provide the most current update to injury incidence and outcomes in NCAA men's wrestling. We identify notable trends that warrant consideration in future research. (© by the National Athletic Trainers' Association, Inc.)

Rosado, A. and S. Henert (2021). "Exploring Attitudes Toward Eating and Body Weight and the Psychological Impact of Weight Loss on College Wrestlers." Journal of sport behavior **44**(2): 224-240.

The current exploratory study addressed a lack of prospective research examining college wrestlers' eating attitudes and behaviors, and the impact of weight loss on their levels of anxiety and depression over the course of a competitive season. Male and female college wrestlers from a small college in the Midwest completed measures of their eating attitudes and behaviors and levels of anxiety and depression (EAT, BAI, and BDI, respectively) during the beginning, middle, and end of their competitive wrestling season. The wrestlers' eating attitudes and levels of anxiety and depression were highest at the beginning of the season, when weight loss was highest. Their attitudes, anxiety, and depression significantly improved throughout the course of the season as their reported weight loss decreased. They rarely engaged in unhealthy eating habits but did use exercise to control their weight. These findings contradict previous cross-sectional research and suggest that college wrestlers' approaches to weight loss may not be as unhealthy as many people believe them to be. Information support regarding safe and effective weight loss/maintenance approaches and strategic program planning would help support the performance, health, and well-being of college wrestlers. Future research should continue to use prospective designs in order to better understand the eating attitudes and behaviors and the psychological impact of weight loss on college wrestlers over the course of a competitive season.

Sams, D. and J. Geiselman (2021). "Effects of Relative Energy Deficiency in Sport (RED-S) on the Growth and Development of Adolescent Wrestlers: A Clinical Review." Nutritional Perspectives: Journal of the Council on Nutrition **44**(2): 5-7.

Relative energy deficiency in sport (RED-S) is a result of low energy availability due to an increase in intensity of exercise accompanied with low caloric intake. RED-S has become an increasingly common diagnosis for many athletes, especially athletes who practice weight restrictive measures for competition. This condition is seen in sports such as gymnastics, weightlifting, and wrestling. Research has examined the effects of low energy availability (EA) on the growth of adolescent athletes by examining body composition, serum biomarkers, and athletic performance. The current literature on wrestlers shows that these athletes have hormone resistance, a decrease in free fat mass, and a decrease in performance when experiencing low EA during the competitive season. Little research on the effects of RED-S exists for wrestlers; however, it is hypothesized that there are negative effects on the growth of wrestlers while competing in their season of play.

Satterfield, N. A. and L. A. Stutts (2021). "Pinning down the problems and influences: Disordered eating and body satisfaction in male wrestlers." Psychology of Sport and Exercise **54**(May)

Objectives: Disordered eating and body dissatisfaction are common concerns among athletes. However, these variables have been minimally explored in male wrestlers. Sociocultural influences can impact drive for muscularity, body satisfaction, and disordered eating, but it is unclear which influences are most prominent in this population. The present study had two aims: 1) examine the nature of drive for muscularity, body satisfaction, and disordered eating in collegiate wrestlers, and 2) investigate which sociocultural influence (general, coach/teammate, sport appearance pressures) most strongly predicts drive for muscularity, body satisfaction, and disordered eating. Methods and design: This study was cross-sectional. Participants included 103 National Collegiate Athletic Association Division I male collegiate wrestlers in the U.S. who completed surveys in season on sociocultural influences, drive for muscularity, body satisfaction, and disordered eating. Results: Wrestlers had a high drive for muscularity and engaged in many unhealthy behaviors to lose weight; however, they had relatively high body satisfaction. Relative weight analyses showed that sport appearance pressures were the strongest predictor of drive for muscularity while general pressures were the strongest predictor of body satisfaction and restricting eating behaviors. Conclusions: Findings suggests that disordered eating needs to be addressed among wrestlers and potential influences to target.

Schießl, J., et al. (2021). "[Trichophyton tonsurans-an emerging pathogen in wrestling in Germany]." Der Hautarzt; Zeitschrift fur Dermatologie, Venerologie, und verwandte Gebiete **72**(10): 878-891.

Trichophyton (T.) tonsurans is considered as the main causative agent of tinea gladiatorum (ringworm) in contact and martial arts worldwide and regularly leads to outbreaks. In the national wrestling squad in Leipzig, dermatophytoses occurred frequently and recurrently in children and adolescents for over a 2-year period. The wrestlers came to the dermatologist's office for clinical examination and sampling. Dermal scales and hair roots as well as smears were examined

mycologically with fluorescence optical preparation, fungal culture, and polymerase chain reaction (PCR) for dermatophyte DNA. Sequencing of the dermatophyte rDNA served as culture confirmation test. Environmental investigations in the wrestler training center included contact cultures and smears from surfaces, in particular from the mats. T. tonsurans was culturally and/or with PCR detectable in 21 out of 25 children and adolescents plus one trainer. T. tonsurans grew in one of ten contact cultures of mats and floors in the wrestling training center, and T. interdigitale was found in another culture. Smears from the mats resulted in a culture of T. tonsurans detection twice. The PCR was positive for T. tonsurans three times. Within 14 days, T. tonsurans developed small, flat, radiating, granular and white-colored colonies with a mahogany-brown reverse side on the fungal culture media. The sequencing of the internal transcribed spacer (ITS) region of the rDNA and the translation elongation factor 1 α (TEF 1 α) gene confirmed the species T. tonsurans in all cases. T. interdigitale that was found from a mat was also identified by sequencing. Eight T. tonsurans strains were subjected to in vitro susceptibility testing to terbinafine. All isolates were sensitive to terbinafine in vitro with minimal inhibitory concentrations of ≤ 0.1 µg/ml.

Sell, K. M., et al. (2021). "Comparison of V̇o2peak and V̇o2max at Different Sampling Intervals in Collegiate Wrestlers." Journal of strength and conditioning research **35**(10): 2915-2917.

The purpose of this study was to determine the difference in the highest oxygen uptake (V̇o2peak) achieved during a maximal effort graded exercise test (GXT) in 20 NCAA Division I male wrestlers using breath-by-breath (BbB) values to the maximal uptake averaged across different time- and breath-based oxygen consumption sampling intervals (V̇o2max). Given the need for aerobic fitness and anaerobic power in wrestling, the accurate determination of V̇o2max is imperative if it is to be used to identify current aerobic fitness and consequently guide sport-specific training programs to address weaknesses in this area. Each subject completed a cycle ergometer GXT during which BbB data were collected via indirect calorimetry and V̇o2peak determined as the highest value. V̇o2max was considered as the average value of 3-s, 5-s, 10-s, 20-s, and 30-s sampling, and 3-b, 7-b, and 11-b sampling during the GXT. Results show that the BbB V̇o2peak was significantly higher than the 5-s, 10-s, 20-s, 30-s, and 11-b ($p < 0.05$). The 3-b V̇o2max was significantly higher than the 20-s and 30-s V̇o2max values ($p < 0.05$). The underestimation of V̇o2peak for each time-based interval sampling approach compared with BbB V̇o2peak is consistent with previous research, but the comparison of BbB data to breath-based interval sampling has not been widely addressed in prior research. The use of a 7-b sampling interval for the determination of V̇o2max may be a promising approach to minimize the systematic errors associated with BbB or less frequent sampling intervals, but future research is needed to further support its application with elite athletic populations such as those in the current study. (Copyright © 2021 National Strength and Conditioning Association.)

Shadgan B, et al. (2021). "Referees can prevent injuries in wrestling; an experience from the 2018 youth Olympic games." British Journal of Sports Medicine **55:A74**(55 (Suppl 1)).

Background Olympic wrestling styles can result in various types of soft tissue and musculoskeletal injuries. Head and face skin contusions and lacerations were the most common type of injuries, followed by ligament sprains, muscle strains and upper limb joint subluxations and dislocations. The main mechanisms of injuries are direct trauma, using legs and arms as levers, falling, and twisting; most injuries happen during the standing position when two wrestlers engage for a takedown and collide with their heads and limbs. It's while performing dangerous actions and some high-risk manoeuvres are forbidden based on current regulations of the United World Wrestling. Recognizing and stopping dangerous actions during wrestling competitions are the responsibility of the referee. We hypothesized that a prompt and proper action of referees to stop dangerous actions and faults could reduce the incidence and severity of wrestling injuries.
Objective To study the potential effect of a proactive and cautious referee practice on reducing the rate and severity of wrestling injuries during international level junior championships.
Design Prospective observational study.
Setting Competitive world-level junior wrestlers.
Participants 768 Junior wrestlers.
Interventions Wrestling referees of 2018 Youth Olympic Games that was held on October 2018 in Buenos Aires were instructed to be extremely careful, prompt and proactive in stopping high-risk and dangerous actions. Data and specifications of injuries among 110 participant wrestlers in 2018 Youth Olympic Games have compared with injuries occurred among 658 wrestlers who competed at 2018 Junior World Championships on September 2018 in Trnava/Slovakia governed by a routine referee practice.

Main outcome measurements Rate, severity, type, location and mechanism of injuries.
Results Rate of wrestling injuries during 2018 Junior world championships and the 2018 Youth Olympic Games were 10.64% and 4.54% respectively.
Conclusions Proactive and cautious actions of wrestling referees to promptly stop dangerous actions has the potential to significantly reduce the rate and severity of injuries in wrestling.

Shadgan, B., et al. (2021). "Wrestling injuries during the Tokyo 2020 Olympic games " British Journal of Sports Medicine **Nov 2021**(55 (Suppl 1)).

Background Understanding the incidence and characteristics of injuries in each sport helps to implement more effective preventive measures. Studying this information after the occurrence of the COVID-19 pandemic was particularly important. Accordingly, the medical commission of the United World Wrestling (UWW) has implemented a systematic surveillance of injuries during the Tokyo 2020 Olympic Games.
Objective To assess the injury profile of elite senior wrestlers in Men's Greco-Roman (GR), Men's Freestyle (FS), and Women's wrestling (WW) during the Tokyo 2020 Olympic Games.
Design Descriptive epidemiologic study.
Setting Clinical.
Participants 286 senior qualified wrestlers participated in Tokyo 2020 Olympic Games.
Interventions UWW injury surveillance database system.
Main Outcome Measurements Athlete's demographic, weight category, injury type, severity, location and mechanism.
Results A total of 286 athletes sustained 28 injuries during 322 matches; 9.8 injuries per 100 athletes (12.1% in men; 5.2% in women) and 8.7 injuries per 100 bouts. Among the 3 styles, WW had the lowest injury rate (5.2%) and FS showed the highest rate (12.8%). More injuries were observed in the low-weight categories (64.3%). The most common injury type was skin laceration and contusion (60.6%) due to direct contact and the most common site of injury was head and face (71.4%). In sum, 78.6% of all injuries were categorized as mild, 10.7% as moderate and 10.7% as severe.
Conclusions No serious or catastrophic injury was recorded during wrestling competitions of the Tokyo Olympic Games, and most injuries were minor. The overall rate of wrestling injuries during the Tokyo 2020 Olympic Games was higher than the 2016 Rio Games but lower than the 2012 London Olympic Games. The severity of injuries, however, was the lowest since the 2004 Athens Olympic Games. COVID-19 pandemic did not result in a higher rate of severe injuries, nor more overuse injuries.

Shevtsov, A. V. and A. I. Laptev (2021). "Osobennosti vozdejstvija sbivajucich faktorov na vysokokvalificirovannych borcov s naru☐eniem slucha v sorevnovatel'noj dejatel'nost." [FEATURES OF THE IMPACT OF CONFOUNDING FACTORS ON HIGHLY QUALIFIED WRESTLERS WITH HEARING IMPAIRMENT IN COMPETITIVE ACTIVITIES] Vestnik sportivnoj nauki; Sports science bulletin(2): 21-24.

The article deals with the features of confusing factors of persons with hearing impairments, specializing in Greco-Roman and freestyle wrestling. The analysis of their impact in the competitive activities of members of national teams in the declared types of wrestling is presented. The most significant confounding factors and their impact on the final competitive result are identified. Confounding factors of exogenous and endogenous nature, cause a negative impact on the mental state, the nature of behavior and the effectiveness of competitive activities of wrestlers. The identification of these factors makes it possible to improve the model of competitive activity of an athlete by introducing them into the training process.

Slacanac, K., et al. (2021). "The relationship between rapid weight loss indicators and selected psychological indicators on success of Croatian wrestlers." Archives of Budo **17**: 67-74.

Background and Study Aim: Reasons why wrestlers and athletes of other combat sports (boxing, judo, taekwondo, etc.) reduce weight loss are better anthropometric characteristics of wrestlers (longitudinal and skeletal volume) compared to opponents in lower weight categories, better focus and motivation of wrestlers, etc. Main cognitive goal of this research was knowledge about the relationship of rapid weight loss indicators and selected psychological indicators on success of Croatian wrestlers. Material and Methods: The research was conducted on 200 Croatian Greco-Roman style wrestlers. The amount of weight loss, the percentage of weight loss, and specific urine density (USG) were determined. Profile of Mood States Questionnaires (POMS), pre-competition

anxiety (SCAI-2), goal orientation (TESQ), and intrinsic motivation (IMI) were used. Results: Statistically significant correlation (p = 0.003) of rapid weight loss indicators and selected psychological indicators, with success was determined. Statistically significant correlation was found in the POMS variables (fatigue, p = 0.014), pre-competitive anxiety (self-confidence, p = −0.017), task orientation (p = 0.019) and intrinsic motivation (competence, p = −0.025). Conclusions: Successful wrestlers, despite being dehydrated, are less tired, more interested, more satisfied, have greater confidence and are more task-oriented than less-successful wrestlers. It is assumed that there are differences between age groups of wrestlers which should be investigated by future research.

Stanbouly, D., et al. (2021). "Craniomaxillofacial injuries from the sport of wrestling: a query of the National Electronic Injury Surveillance System (NEISS)." Oral and Maxillofacial Surgery:

Abstract: Purpose: The purpose of this study was to provide a novel report on the head and neck injuries from the sport of wrestling and their characteristics in the USA. Materials and methods: This is a 20-year retrospective cross-sectional study conducted using the National Electronic Injury Surveillance System (NEISS). Reports were included in the analysis if the injury stemmed from combat with another person. The predictor variables were obtained from both patient and injury characteristics. The principal outcome variable was admission rate, which was used to proxy the severity of the injury at hand. Bivariate analysis (i.e., chi-square and independent sample tests) was used to determine if an association existed between two variables of interest. Results: The final sample in our study consisted of 4485 cases of craniomaxillofacial injuries secondary to wrestling. The increase in injuries from the year 2000 to 2019 was significant (P < 0.05). The average age of patients was 15.73 (range: 3 to 59 years old). Virtually all of the injuries occurred in males (95.6%). The majority of patients was under the age of 18 (82.3%). With regard to race, white wrestlers (57.1%) comprised the majority of patients. Insight into race was not available for 1245 patients (27.8%). Most wrestling-related injuries took place during the winter season (60.6%). Concussion was the most common primary diagnosis (29.0%). The head (57.1%) was the most commonly injured craniomaxillofacial region. The most common setting in which the injury took place was a place of recreation/sports (49.9%). Among the mechanisms of injuries, the take-down (26.5%) was the most common. Patients who were thrown/taken down (5.04%) were significantly more likely to get admitted (P < 0.01) relative to patients who were injured otherwise (2.6%). Similarly, patients who fell/tripped (6.6%) were significantly more likely to get admitted (P < 0.05) relative to patients who were injured otherwise (3.1%). While cases of concussion (6.0%) were significantly more likely to get admitted (P < 0.01) relative to other cases, cases of contusions/abrasions (0.6%) were significantly less likely to get admitted (P < 0.01) relative to other cases. Similar to contusions/abrasions (0.2%), lacerations were significantly less likely to get admitted (P < 0.01) relative to other cases. Patients aged 12–18 (P < 0.01) were most likely to suffer concussions, whereas patients aged 19–34 (P < 0.01) were least likely to suffer concussions. In contrast to concussions, patients aged 12–18 (P < 0.01) were least likely to suffer lacerations, whereas patients aged 19–34 (P < 0.01) were most likely to suffer lacerations. Patients aged 6–11 (P < 0.01) were most likely to be thrown/taken-down whereas patients aged 19–34 (P < 0.01) were least likely to be thrown. Patients aged 19–34 (P < 0.01) were most likely to be collided against intentionally, while patients aged 6–11 (P < 0.01) were least likely to be collided against intentionally. Patients aged 34 years or older were most likely to fall/trip, while patients aged 12–18 (P < 0.01) were least likely to fall/trip. Conclusions: Certain types of injuries that occur during wrestling are more or less common depending on the age groups involved in the sport. Concussions were the most common injury incurred overall, and the head is the most commonly affected craniomaxillofacial area. Take-downs were the most likely mechanism of injury to lead to hospital admissions. The average number of wrestling injuries increased over 20 years being analyzed in this study. Future studies should investigate methods to lessen concussions in wrestling, decrease the number of illegal moves performed, and look into ways to mitigate harm from take-downs, given the increasing number of injuries acquired from this sport.

Tarakanov, B. I., et al. (2021). "Covid-19 related training service restrictions: effects on competitive technical scores in elite women`s freestyle wrestling." Theory and Practice of Physical Culture (8): 3-5.

Objective of the study was to analyze effects of the COVID-19 related training service restrictions on the competitive technical scores in the women`s freestyle wrestling elite. Methods and structure of the study. We collected the input data for analysis from the refereeing protocols and video captures of the Russian Freestyle Wrestling Championship (RFWC) that was rescheduled from May to September 2020 as a result of the pandemic. The RFWC-2020 records reported 152 competitors

and 179 bouts in all weight classes. The input data was used to compute the competitive technical scores as recommended by the leading experts to produce: total/ scoring technical and tactical actions; competitive technical and tactical actions scoring ratios; technical and tactical actions averages per bout and minute; technical and tactical actions success rates; attack-to-attack intervals; average bout time, etc. We analyzed the women`s freestyle wrestling elite`s competitive performance data for the RFWC-2020 versus the pre-pandemic RFWC-2018 to rate the regress in the competitive performance due to the COVID-19 related training service restrictions. Results and conclusion. The ongoing COVID-19 pandemic has heavily restricted social contacts and physical activity the world over and forced the sporting communities to limit and adapt the training systems as required by the lockdown and self-isolation regulations. As a result, the special training service has been heavily limited at detriment to the competitive performance in many sports including the national elite women`s freestyle wrestling sport. Our study has found, however, that the forced limitations of the training service have had their `silver lining` in some aspects. On the positive side, we would mention growth in the numbers of qualifiers for the national women`s freestyle wrestling championship due to rehabilitation of chronic injuries; and higher competitive motivations, with the athletes clearly eager to compete after the long, forced break. On the negative side, we found a significant drop in many competitive performance indicators with the inevitable sags in the competitive activity and scoring actions. The study data and analyses are recommended for consideration by the elite freestyle wrestling and coaches in their training for the upcoming World Wrestling Championship and Olympic Games in Tokyo.

Tropin, Y., et al. (2021). "Improvement of the technical and tactical preparation of wrestlers with the consideration of an individual combat style." SportMont **19**(2): 23-28.

The present research reviews a programme for improving athletes` technical and tactical preparation with a consideration of individual combat style. The program has included training models for each style and has considered the characteristics of the current competitive activities of Greco-Roman wrestlers. Thirty qualified Greco-Roman wrestlers of middle-weight categories have participated in the research. Throughout the experiment (a year-long preparation cycle) the indicators of technical and tactical preparedness of the athletes of the experimental group have improved: the efficiency of defence in stand and ground positions has become higher; the reliability and efficiency of attack and defence actions have increased; the wrestlers have begun to perform a greater number of exercises in stand and ground positions, and to perform successful attacks more often; the interval between the attacks has been shortened. During the experiment, the indicators of technical and tactical preparedness of the athletes of the experimental group have increased from 7.3% to 19.7%, while in the control group from 0.4% to 4.9%. It has been determined that all the considered indicators of the experimental group`s technical and tac- tical preparedness after the experiment are statistically higher p<0.05; p<0.01) than the indicators of the control group. This finding indicates the efficiency of the proposed programme of improvement of technical and tactical preparedness for athletes considering individual combat style and a possibility of its implementation into the training process.

Ulupınar, S., et al. (2021). "Performance Differences Between Greco-Roman and Freestyle Wrestlers: A Systematic Review and Meta-Analysis." Journal of Strength & Conditioning Research **35**(11): 3270-3279.

This systematic review and meta-analysis aims to summarize evidence on performance differences between Greco-Roman (GR) and freestyle (Fr) wrestlers. Eleven studies met the inclusion criteria (91 individual data and a total of 752 wrestlers). The analysis of handgrip strength comprised 9 outcomes from 5 studies with no significant difference between GR and Fr wrestlers. The analysis of isometric (back or leg) strength comprised 15 outcomes from 6 studies with a significant effect favoring GR wrestlers. The analysis of muscle power comprised 15 outcomes from 5 studies with a significant effect favoring GR wrestlers. The analysis of strength endurance comprised 4 outcomes from 3 studies with no significant difference between GR and Fr wrestlers. The analysis of anaerobic capacity and power comprised 6 outcomes from 3 studies with no significant difference between GR and Fr wrestlers. The analysis of speed comprised 19 outcomes from 7 studies with a significant effect favoring GR wrestlers. The analysis of flexibility comprised 20 outcomes from 6 studies with a significant effect favoring Fr wrestlers. This study indicated that GR wrestlers had greater isometric strength, muscle power, and speed performance, but Fr wrestlers had greater flexibility. Given the significant effect sizes favoring GR wrestlers, it is possible that they focused on training strategies to improve physical strength-power performance. However, considering the significant effect size favoring Fr wrestlers, it is possible that they focused on training strategies to improve flexibility because Fr wrestling techniques require a larger range of motion during both attack and defense.

Valdés-Badilla, P., et al. (2021). "Effects of Olympic Combat Sports on Older Adults' Health Status: A Systematic Review." International journal of environmental research and public health **18**(14).

> The aim of this systematic review was to analyse the studies centered on the effects of Olympic combat sports (OCS [i.e., boxing, fencing, judo, karate, taekwondo, wrestling]) on older adults' physical-functional, physiological, and psychoemotional health status. The review comprised randomised-controlled trials with OCS interventions, including older adults (≥60 years), and measures of physical-functional, physiological, and/or psychoemotional health. The studies were searched through SCOPUS, PubMed/MEDLINE, Web of Science, PsycINFO, and EBSCO databases until 5 January 2021. The PRISMA-P and TESTEX scales were used to assess the quality of the selected studies. The protocol was registered in PROSPERO (code: CRD42020204034). Twelve OCS intervention studies were found (scored ≥ 60% for methodological quality), comprising 392 females and 343 males (mean age: 69.6 years), participating in boxing, judo, karate, and taekwondo. The qualitative analysis revealed that compared to controls, OCS training improved muscle strength, cardiorespiratory capacity, agility, balance, movement, attention, memory, mental health, anxiety, and stress tolerance. Meta-analysis was available only for the chair stand test, and an improvement was noted after OCS training compared to control. In conclusion, OCS interventions improves older adults' physical-functional, physiological, and psychoemotional health. Our systematic review confirms that OCS training has high adherence (greater than 80%) in older adults.

Vasilescu, F., et al. (2021). "Contributions Regarding the Development and Experimentation of a Specific Physical Training Model for Greco-Roman Junior Wrestlers." Romanian Journal for Multidimensional Education / Revista Romaneasca pentru Educatie Multidimensionala **13**(2): 442-456.

> The use of methods to objectify the specific activities of athletes in training and competitions is not a problem studied to its true extent in wrestling. Measuring and evaluating the predictability components of competitive performance in this sport is even more important given the fact that in free and Greco-roman wrestling the elaboration of models has never been easy, due to the unquantifiable performance that performers have to achieve. Therefore, the issue is the most important field of research in the current stage in sports wrestling, before becoming an operational tool available to practitioners. The transformation of these components into figures allows obtaining results that can define the weight and impact they have in creating training and competitive models, selection models, planning, control and evaluation of the efficiency of training methods and especially the establishment of a battery of tests, usually validated by the method of factor analysis, to support periodic improvements by assimilating the progress in knowledge. From this point of view, we proposed the elaboration of the action strategy in order to increase the efficiency and highlight some components of the specific physical training model, whose materialization at the level of junior athletes decisively influenced the training activity, as a premise in obtaining the performance goals. Our experimental approach took place at the Dinamo Bucharest Sports Club, where the junior sports of the club and the national junior team trained. The training of the junior wrestlers from the Greco roman style according to the parameters of the specific physical training model foreshadowed by us, demonstrated its efficiency and led to the modeling of the wrestling behavior and performance compatible with that of high-performance wrestlers.

Wang, L., et al. (2021). "Sports Action Recognition Based on GB-BP Neural Network and Big Data Analysis." Computational intelligence and neuroscience

> In recent years, the application of the gradient boosting-back propagation (GB-BP) neural network algorithm in many industries has brought huge benefits, so how to combine the GB-BP neural network algorithm with sports has become a research hotspot. Based on this, this paper studies the application of the GB-BP neural network algorithm in wrestling, designs the sports athletes action recognition and classification model based on the GB-BP neural network algorithm, first analyzes the research status of wrestling action recognition, and then optimizes and improves the shortcomings of action recognition and big data analysis technology. The GB-BP neural network algorithm can realize the accurate recognition and classification of wrestlers' training actions and carry out big data mining analysis with known action recognition, so as to achieve accurate classification. The experimental results show that the model can play a good role in wrestling and effectively improve the efficiency of wrestlers in training.

Zadorozhna, O., et al. (2021). "The importance of information blocks, which form the basis of tactical knowledge at different stages of long-term development in modern Olympic combat sports." Ido Movement for Culture. Journal of Martial Arts Anthropology **21**(2): 27-40.

Problem. The problems of tactical training in combat sports are represented in a large number of scientific and methodological works. The efforts of researchers are mostly aimed at expanding the arsenal of technical and tactical actions, and to find the most effective ones which allow athletes to compete against different opponents as successfully as possible. They also develop the tools and methods for such training. However, the formation of tactical knowledge and tactical thinking, which are the basis of the tac-tical preparedness of athletes, is considered fragmentary. Aim. The purpose of the research was to determine the importance of information blocks which could be the basis of tactical knowledge at different stages of long-term development in modern Olympic combat sports. Method. The study used theoretical analysis and generalization to identify the main problems of tactical training in Olympic combat sports. Expert assessment was aimed at determining the most important provisions of tactical knowledge. 40 experts in fencing, wrestling, boxing, judo, taekwondo WTF, and karate WKF were recruited. In order to confirm the accuracy of the written examination, the concordance coefficient was determined in each group of experts (W). Results and Conclusions. Several approaches could be used to form tactical knowledge: a universal one that is the same for all or most Olympic combat sports (3-5 types), and a modified one that is in demand in 1-2 types. The most important for each Olympic combat sport is the topic "Competition rules". Other topics have different significance depending on the stage and kind of combat sport

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