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2023

Annual Compilation of Wrestling Research

UWW Wrestlers of the Year:
Aisuluu Tynybekova, Kyrgyzstan (FW)
Orta Sanchez, Cuba (GR)
Ahmed Tazhudinov, Bahrain (FS)

David Curby, EdD
davcurb@gmail.com
International Network of Wrestling Researchers (INWR)

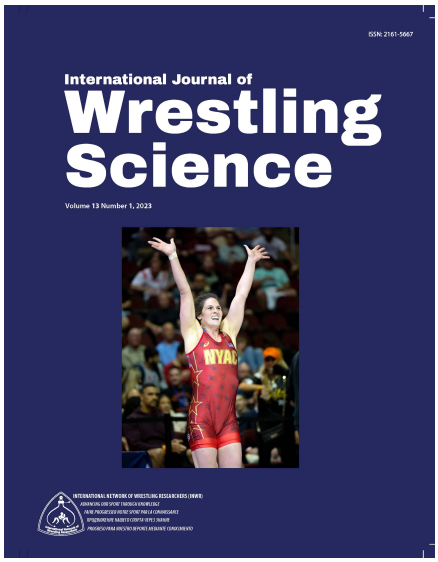
The Annual Compilation of Wrestling Research 2023 is compilation of published wrestling-related research published during 2023 and is provided by the International Network of Wrestling Researchers (INWR). The INWR is the largest scientific support group for a sport in the world! Our group has grown to over 500 academics, scientists, doctors and wrestling professionals, from 89 countries who are involved with the sport of wrestling. (www.inwr-wrestling.com) Our Mission Statement is:

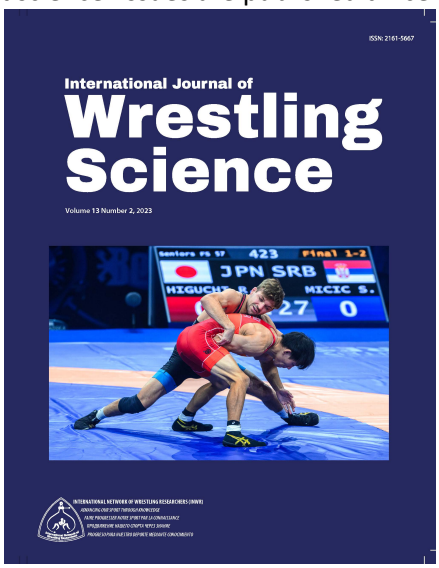
> *The International Network of Wrestling Researchers (INWR) seeks to facilitate the development of wrestling around the world by drawing all wrestling sport science professionals together, in a manner that through our international and intercultural cooperation we are empowered to support the development of wrestling with our research and educational programs.*

We have organized scientific meetings at the senior world wrestling championships and we were instrumental in working with United World Wrestling (UWW) in establishing the Scientific Commission. The INWR sponsors the **Rayko Petrov Award** memorializing the great Bulgarian wrestler, coach and prolific scholar. Each year the INWR names the person to be honored and that person delivers the memorial lecture at the INWR Annual Meeting. They are presented with the spectacular bronze trophy by Christo Christov commissioned by the Bulgarian Wrestling Federation.

The **Young Researcher Award** is also presented to a researcher less than thirty years of age.

We publish the ***International Journal of Wrestling Science*** which is the only journal dedicated to the study of the world's oldest sport. The International Journal of Wrestling Science is a peer reviewed journal for professionals working in wrestling and wrestling sport science. Issues are published twice a year.





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ANNUAL INWR COMPILATION OF WRESTLING RESEARCH 2023

Agatovich, I. R. (2023). VISUALIZATION METHOD BASED ON MULTIMEDIA IN TEACHING TECHNICAL AND TACTICAL ACTIONS TO YOUNG WRESTLERS. "Metod vizualizacii na osnove multimedijnych sredstv v obucenii techniko-takticeskim dejstvijam junych borcov." Scientific Impulse **1**(6): 2115-2121.

Training process of young wrestlers of the Greek-Roman style has to rely on wide use of multimedia technologies, computer modeling, interactive methods which use statistics on a new round of scientific judgment a problem of visual teaching methods in modern system of training and training. Use of multimedia means admits necessary and demanded training process of young athletes and though they completely can't and shouldn't replace the trainer, at the same time their use in training allows to present elements of the mastered equipment in more detail, to see own errors of execution on the screen, to correlate the equipment to equipment of reference group. The purpose of the conducted research -justification of opportunity and efficiency of use of multimedia means for visualization of actions of young wrestlers of the Greek-Roman style in the course of performance of tasks on technical and tactical preparation by means of the developed author's program and methodical multimedia complex "Wrestling multimedia".

Ahmed, O. S., et al. (2023). "Body composition and physical fitness of different blood groups in Olympic athletes." JOURNAL OF HUMAN SPORT AND EXERCISE.

Background and Aim: A comprehensive understanding of an athlete's physical fitness and overall condition is paramount in professional sports, especially wrestling. Such insights are instrumental in talent identification, sculpting training regimens, and, ultimately, ensuring success on the field. Given this backdrop, this study embarked on a mission to meticulously investigate the variances in body composition and diverse elements of physical fitness among the elite Olympic athletes of Iraq. The emphasis was on delineating correlations or disparities based on their blood groups. Methods: Adopting a robust semi-experimental approach, this research incorporated 40 young, spirited wrestlers from Baghdad. These athletes represented a spectrum of blood groups: A, B, AB, and O, all unified by a positive RH factor. Spanning from January 2021 to May 2023, post the acquisition of informed consent; these participants underwent rigorous laboratory evaluations. These assessments delved into determining their blood group, deciphering body fat percentages, BMI metrics, and gauging attributes like endurance, muscle tenacity, speed, agility, anaerobic prowess, and peak oxygen consumption. To ensure data integrity, analyses were diligently performed using the renowned SPSS22 software, with a stringent significance benchmark of .05. Results: The findings were revelatory. Clear-cut distinctions were evident across the four blood group categories ($p < .05$). Athletes with the O blood group consistently eclipsed their counterparts, while the AB group presented a contrasting picture, trailing in most metrics. Conclusion: The research underscores that an athlete's blood group might significantly determine their physical composition and performance capabilities, especially in Olympic sports.

Keywords: Sport medicine, Health, Olympic athletes, Physical fitness, Blood groups, Body composition.

Aleksandra, M., et al. (2023). "Disrupting arrhythmia in a professional male wrestler athlete after rapid weight loss and high-intensity training—Case report." Frontiers in Cardiovascular Medicine 10.

Introduction Physiological heart adaptations may lead to increased susceptibility to arrhythmia in athletes. Furthermore, vigorous training and method like rapid weight loss (RWL) in combat sports could pose

additional risks. This case represents how routine cardiovascular screening during high-risk methods like RWL and high-intensity training (HIT) reveal abrupt ventricular arrhythmias in a young athlete. Case report. We report a case of a 20-year-old male wrestler athlete who developed disrupting arrhythmia during RWL and HIT. The study included: a medical exam, 12 lead electrocardiograms (ECG), transthoracic echocardiogram (ECHO), and 24 h of continuous ECG monitoring in baseline, phase one (P1), (in which the athlete had to simulate RWL through vigorous training and dietary intervention and HIT) and phase two (P2), (with the same HIT protocol performed without the RWL procedure). Baseline laboratory analyses were without abnormalities, ECG showed sinus rhythm with one premature atrial contraction (PAC) and ECHO showed signs of concentric remodeling with preserved systolic, diastolic function, and global longitudinal strain. After P1 RWL simulation, he lost 5.15% of body weight in 3 days, which resulted in lower blood glucose levels, higher urea, creatinine, creatine kinase (CK), CK-MB levels, and slightly increased levels of NT pro-BNP, ECG revealed sinus rhythm with one ventricular premature beat (VPB), 24-h continuous electrocardiogram (ECG) revealed frequent ventricular premature beats (PVB) 2,150/ 24 h, with two couplets, and 8 PAC. After an advised 4-week period of de-training continuous 24 h, ECG monitoring was improved with only occasional PVB. The 24 h continuous ECG monitoring was repeated after HIT and revealed even more frequent PVB, 5% of all beats for 24 h, 4,205 in total, and almost all VPB were in bigeminy and trigeminy. The athlete was advised against RWL and extremely vigorous exercise and for regular, frequent checkups with occasional ECG monitoring during and after exercise. Conclusion. The short and long-term implication of abrupt ventricular arrhythmias provoked by intensive training and methods like RWL is unknown. We postulate that cardiovascular screening is necessitated, especially during high-risk methods like RWL and HIT, in helping us prevent adverse outcomes and come to individual-based clinical making decisions for each athlete.

Andrew, R. J., et al. (2023). "Validation of skinfold equations and alternative methods for the determination of fat-free mass in young athletes." Frontiers in Sports and Active Living **5**.

Intoduction. To cross-validate skinfold (SKF) equations, impedance devices, and air-displacement plethysmography (ADP) for the determination of fat-free mass (FFM). **Methods**. Male and female youth athletes were evaluated (n = 91[mean ± SD] age: 18.19 ± 2.37 year; height: 172.1 ± 9.8 cm; body mass: 68.9 ± 14.5 kg; BMI: 23.15 ± 3.2 kg m−2; body fat: 19.59 ± 6.9%) using underwater weighing (UWW), ADP, and SKF assessments. A 3-compartment (3C) model (i.e., UWW and total body water) served as the criterion, and alternate body density (Db) estimates from ADP and multiple SKF equations were obtained. Validity metrics were examined to establish each method's performance. Bioelectrical impedance analysis (BIA), bioimpedance spectroscopy (BIS), and the SKF equations of Devrim-Lanpir, Durnin and Womersley, Jackson and Pollock (7-site), Katch, Loftin, Lohman, Slaughter, and Thorland differed from criterion. **Results**. For females, Pearson's correlations between the 3C model and alternate methods ranged from 0.51 to 0.92, the Lin's concordance correlation coefficient (CCC) ranged from 0.41 to 0.89, with standard error of the estimate (SEE) ranges of 1.9–4.6 kg. For SKF, the Evans 7-site and J&P 3 Site equations performed best with CCC and SEE values of 0.82, 2.01 kg and 0.78, 2.21 kg, respectively. For males, Pearson's correlations between the 3C model and alternate methods ranged from 0.50 to 0.95, CCC ranges of 0.46–0.94, and SEE ranges of 3.3–7.6 kg. For SKF, the Evans 3-site equation performed best with a mean difference of 1.8 (3.56) kg and a CCC of 0.93. **Discussion**. The Evans 7-site and 3-site SKF equations performed best for female and male athletes, respectively. The field 3C model can provide an alternative measure of FFM when necessary.

Artemenko, T. G., et al. (2023). "ANALYSIS OF THE VIEWS OF D.P. KORKIN FOR BUILDING THE TRAINING PROCESS IN WRESTLING." Teoriya i Praktika Fizicheskoy Kultury 2023(12): 16-18.

Objective of the study was to analyze the scheme of stages of teaching technical actions and techniques in freestyle wrestling according to the methodology of coach D.P. Korkina. Methods and structure of the study. The article analyzes the manuscripts of the Soviet freestyle wrestling coach D.P. Korkin, who describe his methodology for constructing the training process in wrestling. Results and conclusions. Four stages in teaching a set of technical techniques have been identified, each of which has three phases identical in content; one of the important goals is the formation of operational thinking based on improving the reaction of choice. At stages of training from the first to the third, the skill of anticipation is formed-to quickly predetermine the most likely actions of an op-ponent by his posture, preparatory movements, general demeanor, gaze, etc. In the third phase of the last stage, the ability to most appropriately choose a motor solution among the many proposed options is formed. The presented scheme, developed by coach D.P. Korkin, requires in-depth attention from specialists in terms of analysis of teaching methods and its practical application.

Athayde, M., et al. (2023). "Influence of maturation level on the development of physical performance in young combat sports athletes: a scoping review." Sport Sciences for Health.

Combat sports practices during childhood and adolescence are accompanied by several beneficial effects. During this phase, the maturity status and timing play an important role for the young athletes and must be considered in youth training programs, especially for those who are about to start (or have already started) formal training and competitions. This scoping review aimed to explore the influence of maturation level on development of physical performance in combat sports athletes in grappling groups (judo, jiu-jitsu, and wrestling). “combat sports” or “judo” or “Brazilian jiu-jitsu” or “wrestling” and “maturation” or “growth” or “puberty” and “anthropometric” and “physical performance.” We followed five sequential methodological stages of: (1) identifying the research question, (2) identifying relevant studies, (3) selecting studies, (4) charting the data, and (5) collating, summarizing, and reporting the results. A total of 11 studies were included, most of which used cross-sectional designs, focused on male judo athletes and investigated several physical tests and somatic maturation indicators (e.g., peak height velocity or predicted adult height). The main physical tests of participants were the maximal isometric handgrip strength test, vertical jump, and medicine ball throw test. Maturity status and timing significantly influence the development of physical performance in young grappling athletes, particularly in judo, wrestling, and Brazilian jiu-jitsu. Training experience, chronological age, and body size and composition also influence the physical performance in these athlete groups.

Ayar, M., et al. (2023). "The effect of a nutrition program for weight loss during the pre-competition period on the body composition, hydration, and mood profile of elite Greco–Roman wrestlers." Sport Sciences for Health: Founded by the Faculty of Exercise Science - University of Milan, official journal of the Italian Society of Exercise and Sport Sciences **19**(4): 1245-1256.

Objective: The study aimed to investigate the effect of a nutrition program introduced among elite Greco–Roman wrestlers during the weight-loss period before the competition on the athletes’ body composition, hydration, and mood. **Methods**: The experimental group comprised the Greco–Roman Wrestling National Team (U23) of different weights (n = 8) and the control group consisted of substitute athletes (n = 8) with the same weights as the experimental group. To achieve the target weight, the experimental group followed a personalized weight loss program under the supervision of a dietitian, whereas the control group lost weight using their own methods. The athletes completed a mood profile questionnaire, food and fluid consumption, urine density evaluation, anthropometric measurements, and body composition assessments were performed. **Results**: The athletes who followed a balanced diet under the guidance of a dietician had decreased body mass index, body

weight, body fat rates (%), and urine density compared to the athletes who used traditional methods ($P < 0.05$). Negative changes in the control group and positive changes in the experimental group were observed in the mood profile scores ($P < 0.05$). There was a higher decrease in variables, including energy (kcal), carbohydrate (g/kg), protein (g/kg), fat (g/kg), and micronutrient consumption, in the control group ($P < 0.05$). **Conclusion**: Change in nutritional intake at the macro and the micro level was found to be more balanced among male athletes who followed a regular and planned nutrition program under a dietitian's supervision. In addition, the experimental group had decreased body fat percentages and urine density and underwent a positive change as confirmed by their mood profile.

Baranauskas, M., et al. (2023). "Establishing Benchmark Percentiles for the Classification of Body Fat Percentage of Professional Male Athletes Competing in Combat Sports through Bioimpedanciometry." Applied Sciences (2076-3417) **13**(17): 9885.

Featured Application: This classification applied to body fat values of Lithuanian combat sports athletes may also encourage propositions for classifying the outcomes derived from skinfold thickness measurements and even dual-energy X-ray absorptiometry to assist sports medicine professionals and sports dietitians. Body composition as a meaningful factor can result in physiological responses in both the physical body and general health status. Nevertheless, the schemes for establishing cut-off points for identifying the classifications of the body fat percentage of athletes competing in combat sports still include gaps. The aim of this study was, by using bioimpedanciometry, to calculate the percentiles for the classification of body fat percentages in Lithuanian professional male athletes ($n = 52$) competing in combat sports with weight classes. A total of 52 Lithuanian professional male athletes competing in combat sports with weight classes were evaluated using a multi-frequency bioelectrical impedance analysis method with frequencies ranging from 1 kHz to 1000 kHz. Percentiles P3, P10, P25, P50, P75, P90, and P97 were used to determine the classification. As a consequence, the following classification categories were assigned: 6.6–7.8% (extremely low); 7.9–10.9% (very low); 11.0–14.7% (below normal); 14.8–18.8% (normal); 18.9–21.5% (above normal); 21.6–29.3% (very excessive); and ≥29.4% (extremely excessive). The assessment of body composition in combat sports athletes identified an inverse association between higher body fat levels and a decrease in the muscle-to-fat ratio (β –1.3, 95% confidence interval (CI): –1.5; –1.0, $p < 0.001$). The relationship between lower body fat percentage and lighter weight categories in which combat sports athletes from different combat sports were competing has been identified (β 0.3%, 95% CI: 0.2; 0.3, $p < 0.0001$). The established cut-off points may assist sports medicine professionals and sports dietitians in monitoring the adiposity of combat sports athletes.

Batmunkh, B. and D. Boldbaatar (2023). "Mongolian wrestling: A symbol of the struggle for Mongolian independence (Seventeenth-Nineteenth Centuries)." COGENT ARTS & HUMANITIES **10**(1).

One of the main features of Mongolian national wrestling is the tradition of awarding titles (tsol) to successful wrestlers at the Naadam Festival. It is interesting to know why Mongolians have been awarding various titles to their wrestlers since the seventeenth century. These historical periods were the years when Mongolians were actively fighting for independence in many fields (politics, religion, culture, etc.). The tradition of awarding titles to Mongolian wrestlers symbolizes the struggle for independence. This tradition has become a celebration of the success of modern Mongolian wrestlers. Currently, Mongolian wrestlers are awarded six titles (nachin, khartsaga, zaan, garuda, arslan, avarga) at the national Naadam Festival. Mongolian wrestling is not just a sport based on sportsmanship and competition for victory. From the history of the development of Mongolian wrestling and its components, it is possible to see the peculiarities of the Mongolian mentality, the sociopolitical

situation, the cultural heritage, and the aspirations of the people. Mongolian wrestling tsol (titles) and chimeg (additional narratives that highlight titles) are some of the key elements that can clearly indicate such a feature.

Berg, M. A. and C. Martin (2023). "Tinea Gladiatorum Detection With a Dermatophyte Test Strip." Clinical Journal of Sport Medicine **33**(1): 67-68.

Objective: Determine sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and concordance of diafactory hs-TP (DTS) to detect tinea gladiatorum using direct potassium hydroxide (KOH) microscopy as the reference standard. Design: Prospective, comparative study. Setting: Seventeen Minnesota high schools during the winter wrestling season. Patients: Seventy-one consecutive high school wrestlers identified with a suspicious rash during skin inspection. Interventions: Samples were obtained from each rash for both DTS and direct KOH microscopy. Main Outcome Measures: Readings were recorded as positive or negative. Results: Direct KOH microscopy identified tinea gladiatorum in 35 of the 71 samples (46%). DTS sensitivity was 80% (95% confidence interval 63%-92%), and specificity was 82% (66%-92%). PPV was 85% (68%-95%), and NPV was 86% (72 %-91%). The DTS result was 83% concordant (72%-91%) with direct KOH microscopy. Conclusions: Similar to rapid Covid antigen tests, DTS required brief, basic training to perform and gave onsite results in 5 to 30 minutes. Although DTS is not approved for use in the United States by the FDA, concordance compared with direct KOH microscopy in diagnosing tinea gladiatorum was similar to results reported for DTS-TU in tinea unguium and tinea pedis. Further study comparing DTS to a reference standard using PCR plus direct microscopy is warranted.

Bialowas, D., et al. (2023). "Examining the effects of pre-competition rapid weight loss on hydration status and competition performance in elite judo athletes." Scientific Reports **13**(1).

The prevalence of rapid weight loss (RWL) among martial arts athletes including judo is very high. Many applied RWL strategies could be dangerous to health and even lead to death. Therefore, the International Judo Federation (IJF) introduced changes in the weigh-in rules, changing the official weigh-in for the day before the competition. Thus, the purpose of this study was to examine the impact of the new IJF rules on hydration status and weight loss strategies among professional judo athletes. Seventeen elite judo athletes participated in the study. Body mass and hydration status, were analyzed before the competition. Moreover, competition result and practice of RWL survey were collected. All subjects reached their weight category limits for the competition. RWL resulted in body mass changes ($p < 0.001$, $\eta p2 = 0.79$) and dehydration among participants (urine osmolality > 700 $[mOsmol*kg]^{-1}$ and urine specific gravity > 1.020 $[g*cm3]^{-1}$). However, urine osmolality ($p > 0.05$, $\eta p2 = 0.18$), as well as urine specific gravity ($p > 0.05$, $\eta p2 = 0.16$), at subsequent time points of measurement revealed no statistical differences. The prevalence of RWL was 100%, and only 17.6% of the athletes declared that they would compete in a different weight category if the competition would be conducted on the same day of the weigh-in. All judo athletes applied RWL procedures using traditional methods to achieve the required body mass (i.e., increased exercise, reduced fluid, and food intake). Dehydration state was not associated with competitive performance ($p > 0.05$).

Borowiec, J., et al. (2023). "Eating disorder risk in adolescent and adult female athletes: the role of body satisfaction, sport type, BMI, level of competition, and training background." BMC Sports Science, Medicine and Rehabilitation **15**(1).

Background: Eating disorders negatively influence athletes' health and performance. To achieve a high level of performance and conform to cultural expectations regarding an athletic body type, female athletes often restrict their diets, which can lead to eating disorders. In addition to factors related to the sports environment, adolescent athletes are subject to changes caused by the maturation process. Therefore, the same factors may have different effects on eating disorder risk among adolescent and adult athletes. This study examined the relationship between eating disorder risk, specific aspects of the sports environment (sport type, level of competition [national and international], and training background), and individual aspects (body satisfaction and body mass index) in two groups of athletes: adolescents and adults. **Methods**: The sample included 241 highly trained female athletes aged 12–30 years (M = 20.68, SD = 4.45) recruited from different sports clubs in Poland. The subgroup of adolescents consisted of 82 athletes, while the number of adult athletes was 159. The Eating Attitudes Test questionnaire was used to assess the eating disorder risk among the athletes. Body satisfaction was measured using the Feelings and Attitudes Toward Body Scale incorporated into the Body Investment Scale. **Results**: Eating disorder risk was prevalent among 14.6% of the adolescent and 6.9% of the adult athletes. Significant associations between eating disorder risk and the studied variables were noted only among adolescent athletes. Univariate logistic regression analysis revealed that the occurrence of eating disorder risk was associated with participation in lean non-aesthetic sports (OR = 11.50, 95% CI: 3.58–37.09). Moreover, eating disorder risk was associated with athletes' lower body satisfaction (OR = 0.80, 95% CI: 0.70–0.92). Body mass index was not included in the final regression model. **Conclusions**: The study indicated that eating disorder risk in adolescent female athletes was related to sport type and body satisfaction. The findings showed that, in adolescent athletes, eating disorder risk was the most associated with practicing lean non-aesthetic sports. Coaches and athletes should be aware that eating disorder risk increases among individuals with a lower body image.

Cai, H. (2023). "EFFECTS OF CORE STABILITY TRAINING ON SPECIFIC STRENGTH IN WRESTLERS." Revista Brasileira de Medicina do Esporte **29**.

Introduction: Boxing is characterized by a high degree of combination of strength and skill and belongs to the sports group of enduring strength and skill combined with long-term continuous whole-body strength output to achieve good results in competition. Therefore, athletes pay more attention to the skills they use all the time, and it is very important to master the techniques correctly and reasonably distribute physical strength accurately. Objective: Explore the effect of core stability training on the specific strength of wrestlers. Methods: 12 top junior level athletes of a provincial women's wrestling team as research objects, 12 people in total, and randomly divided into control and experimental groups with six people. Results: After the test, the data changes in the experimental group were highly significant compared to before and after the experiment ($P<0.01$). The data changes between the experimental and control groups were significantly different before and after the experiment ($p<0.05$), showing that the special strength of core stability training fighters has a small increase. Conclusion: Core stability training is useful for the specific strength of wrestlers. *Level of evidence II; Therapeutic studies - investigation of treatment outcomes.*

Castro, M. M., et al. (2023). "Luchadoras Pensadoras: Reframing the development outcomes of Latina high school wrestlers." Journal of Research on Adolescence (Wiley-Blackwell) **33**(3): 750-761.

Many necessary developmental assets and competencies can be accrued through the participation of sport that aid in the holistic healthy development of adolescent girls; however, much research in this area has focused on adolescent girls as a monolithic group, disregarding the specific outcomes of sport for girls of color. Through analysis of semi structured interviews of 31 Latina high school wrestlers, we identified various developmental outcomes associated with their sport involvement. We apply a new epistemological approach to

positive youth development within the context of sports development through the usage of extensive narratives of two of the girls. This study explores adolescent Latinas' involvement in high school wrestling, a sport that is widely male dominated yet rising in popularity.

Cavas, L., et al. (2023). "Re-visiting lactate dehydrogenase from a different dimension: a model bioinformatics study for wrestling." Biotech Studies **32**(1): 17-23.

Sports bioinformatics is of great importance in the understanding of sports performance from different perspectives. Accumulated bio-sequences in databases provide considerable contributions to compare proteins in different organisms. In Kingdom of Animalia, some animals have experienced evolution for excellent athletic performances in nature. The present paper exhibits a model in silico approach for the evaluation of sports performance by comparing lactate dehydrogenases (LDH) in humans (Homo sapiens) and saltwater crocodiles (Crocodylus porosus). The results show that a high sequence similarity is observed between the LDHs from H. sapiens and C. porosus with minor modifications. The stability and grand averages of hydrophobicity index values for studied LDHs were found as 24.79–25.18 and-0.006 –0.020 in H. sapiens and C. porosus, respectively. In conclusion, the identification of amino acid modifications in important enzymes of specific animals that are related to sports physiology are lessons we learn from nature, which can open a new gate for the development of sports performance and talent selection.

Chen, L., et al. (2023). "The effects of specialized strength training and Olympic weightlifting training on wrestlers." Medicina dello Sport **76**(3): 310-318.

BACKGROUND: Olympic weightlifting training and specific strength training are both effective means of improving athletes' physical fitness. However, the effects of these exercises in young wrestlers are unknown. Nowadays, the increasing intensity of competitive competitions has put forward higher requirements on athletes' physical fitness and sport techniques. This study is used for wrestlers through the development of Olympic weightlifting and specific strength training programs in order to provide reference for the improvement of athletes' physical strength. METHODS: Eighteen wrestling college students (mean age 16.00±2.00 years) were randomly assigned to the Olympic weightlifting training group (N.=9) and the specific strength training group (N.=9). The whole experiment lasted for 6 weeks. The athletes' strength performance and impact technology performance were measured by upper limb push strength the squatting strength of lower limbs was expressed. RESULTS: In terms of strength performance, in terms of bench press (F=6.91; P=0.018 <0.05), the specific strength training group and Olympic weightlifting training group showed that the post-test performance was better than the pre-test performance respectively (F=7.7, P=0.012 <0.0125; F=42.4, P=0.000 <0.0125); In terms of lower limb squatting (F=8.88; P=0.009 <0.05), only the post test results of the Olympic weightlifting training group were better than the pre-test results (F=28.98; P=0.000 <0.0125). CONCLUSIONS: Both Olympic weight training and specific strength training can improve upper body strength in wrestlers, while only the Olympic weight training group has significant improvements in lower body strength. Level of evidence II; Therapeutic studies - investigation of treatment results.

Curby, D. (2023). "Heavyweight limits for men." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(1): 51-59.

Beginning with the 1985 world championships, FILA instituted a maximum weight of 130 kg (286 lbs.) for the highest weight class. In past days the heavyweight division was also called "unlimited," since there were no upper limits. As a matter of fact, in the first modern Olympic Games, there was only one class for everyone.

Throughout the 20th century there was a gradual increase in the number of weight classes used in the Games. It can be a bit confusing since some of the early Games did not always have competition in both Greco-Roman and Freestyle. Sometimes, even when there were both styles, they had different weight classes. The number of classes grew, as well as the minimum weight used for the heavyweight class.

Curby, D. (2023). "History of doping violations in Olympic wrestling." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(1): 30-46.

Doping is not new in sport and has ancient origins. From the moment in which individuals began to practice physical activity in competition with others, they have sought to improve their own performance by taking mixtures of various types of plants, mushrooms and meats. The ancient Greek athletes drank wine potions, and used hallucinogens and ate animal hearts or bull or sheep testicles in search of potency. Roman gladiators used stimulants and hallucinogens to prevent fatigue and injury. Gladiators ingested strychnine to stave off fatigue and injury and to improve the intensity of their fights (Mazzeo, Altavilla, D'Elia, & Raiola, 2018). Like many Olympic competitors, Nero drank a potion of the ashes of wild-boar dung in water, to refresh himself. (Pliny the Elder, The Natural History (Book 28)), (Bowers, 1998).

Curby, D., et al. (2023). "Performance of wrestlers at the Olympic Games: gender aspect." Pedagogy of Physical Culture and Sports **27**(6): 487-493.

Background and Study Aim With the growing popularity of freestyle wrestling, researchers are increasingly focusing on gender factors that might influence competitive performance and success. The aim of this study is to determine the differences in performance indicators between male and female wrestlers at the 2021 Olympic Games. *Material and Methods* The study involved 192 athletes, with 96 male and 96 female wrestlers. Match records and video footage from the 2021 Tokyo Olympic Games were analyzed for both women's (n=113) and freestyle (n=114) wrestling. Performance indicators were assessed using an expert evaluation approach. Data was statistically analyzed using licensed Excel spreadsheet software, and categorical data was presented in absolute numbers and percentages. *Results* From an analysis of the competitive events at the 2021 Olympic Games, 12 primary technical tactical actions emerged. In the standing position, leg attacks were predominant, executed by male wrestlers 35.8% of the time and by female wrestlers 30.3%. On the ground, male wrestlers favored the gut wrench (7.6%), while females opted for the ankle lace (9.4%). Both male (926 points) and female wrestlers (912 points) garnered roughly equivalent points for their actions. However, males outperformed females in the standing position, scoring 720 points to the females' 621. Conversely, in ground positions, female wrestlers were more effective, scoring 291 points against the males' 206. Rule violation deductions were notably fewer for female wrestlers (8 instances) than for their male counterparts (27 instances). Additionally, challenge review stoppages were less frequent for females (7 instances) compared to males (18 instances). *Conclusions* The study highlights distinct performance indicators in freestyle wrestling between genders. Male wrestlers predominantly act in the standing position (81.7%), whereas female wrestlers lean towards the ground positions (29.3%). In contrast, males account for only 18.3% on the ground. Overall, male wrestlers perform a higher total number of actions (579) than their female counterparts (518). Notably, female wrestlers secure more early victories, constituting 32.7% of all matches, compared to 24.6% by males. These insights can guide coaches in tailoring training programs that cater to these gender-specific nuances.

Deliceoğlu, G. (2023). "Comparison of Physical and Physiological Profiles Between Elite Freestyle Men And Women Wrestlers." European Journal of Human Movement **50**.

This study aims to compare the physical and physiological profiles between elite men and women wrestlers of free style category. The research group consist of twenty-nine men and twenty-one women freestyle wrestlers who camped for performance tests at the Turkish Olympic Preparation Center in Ankara 2 months before the European Wrestling Championship in Budapest on March 28-April 3, 2022. Subjects performed the leg and arm Wingate anaerobic test (anaerobic power and capacity), VO2max (aerobic endurance), Reactive agility, isokinetic and isometric strength test. The results showed that Lower Extremity anaerobic power obtained from men, knee flexor at VO2max, 60°/s and 180°/s peak torque, isometric force values of arm and trunk extensor muscles, are higher than in women ($p<0.05$). In contrast, upper extremity anaerobic power values seem to be similar ($p>0.05$). As a result, it can be said that the endurance capacity, isometric, and isokinetic strength parameters are more effective than the force parameter in gender. These results can be used by coaches, strength and conditioning specialists, and sport scientists to create a comprehensive physical and physiological profile of wrestlers that will help them adapt their training programs.

Descheemaeker, K., et al. (2023). Starting and specializing ages across Olympic sports: A cross-sectional study in an international sample of elite athletes. Conference Proceedings of 31st European Sport Management Conference - Belfast - Northern Ireland, Belfast, United Kingdom, 13 Sep 2023 - 15 Sep 2023.

AIM AND RESEARCH QUESTIONS Talent development models are frameworks that can be used to develop potential athletes. This paper intends to adapt talent development models to specific sports by investigating starting and specializing ages across Olympic disciplines. Three key research questions guided this study: (1) What are sport specific starting and specialization ages in elite athletes? (2) Is there a relationship between one`s starting and specializing age? (3) How can we classify sports according to the starting and specialization ages? THEORETICAL BACKGROUND AND LITERATURE REVIEW In each sport, national sporting organizations (NSOs) attempt to optimize their talent development strategies to attain excellence at, for example, the Olympic Games. However, how exactly NSOs can develop outperforming elite athletes is a source of debate between researchers with early diversification and early specialization as contradicting developmental strategies (Barth et al., 2022). Frequently used talent development models, such as the Developmental Model of Sport Participation (DMSP) (Côté et al., 2007) and the Long-term Athlete Development Model (Balyi et al., 2013), provide age guidelines for progression through different developmental stages. However, these models are not supported with empirical sport specific data on starting and specialization ages. Because early specialization is criticized to have harmful consequences such as social isolation and overuse injuries (Malina, 2010), it is essential that we have empirical data to differentiate early from late specialization sports. RESEARCH DESIGN, METHODOLOGY AND DATA ANALYSIS A total of 2934 athletes (43% female), from 14 nations and 44 Olympic sports, were involved in this study. Mean sport specific starting and specializing ages were computed based on a retrospective survey of the ages in every athlete. The mean diversification period is estimated by the difference between the specialization and starting age in each sport. Pearson`s correlation coefficient was computed to assess the linear relationship between starting and specialization ages. Finally, according to the age categories of Côté et al. (2007), sports are classified in nine different categories based on their starting (early (<6y)/normal/late(>12y)) and specialization ages (early(<12y)/normal/late(>16y)). FINDINGS/RESULTS AND DISCUSSION Athletes started with their current elite sport at the age of 10.6 (±5.3) years and decided to focus on this sport at the age of 15.6 (±5.0) years. Hence, the diversification period was on average 4.9 years. Sport specific starting ages vary from 6.0 years in tennis to 20.2 years in bobsleigh. Specializing ages range from 10.7 years in artistic gymnastics to 21.7 years in bobsleigh. There is only a moderate relationship between the starting age and the specialization age ($r(df)=0.639$, $p<0.01$). In some sports, despite a relatively early start, athletes specialize only after the age of 15 years. The diversification period is the longest in skiing (7.6 years), football (7.5 years), and basketball (7.4 years). In other sports, there is only a small amount of time between the starting and specialization age (bobsleigh (1.5 years), boxing (1.6 years), and weightlifting (1.8 years)). The findings identify artistic gymnastics, rhythmic gymnastics, and synchronized swimming as early specialization sports. Canoe,

wrestling, and weightlifting are late starting sports but have a normal specialization age. Contrarily, curling, sailing, and volleyball have a normal starting age but are characterized by a late specialization age. Nine Olympic sports (bobsleigh, archery, triathlon, shooting, cycling, rowing, athletics, biathlon, and boxing) are characterized by both a late starting age and a late specialization age. CONCLUSION, CONTRIBUTION, AND IMPLICATION This study contributes to the talent development literature by providing empirical data on starting and specializing ages of almost all Olympic sports. These data were used to classify sports, based on the age categories of Côté et al. (2007). Only three sports were identified as early specialization sports. This leads to the main conclusion that for many Olympic sports, specific training from an early age is not a prerequisite for international success. In the majority of sports, which can be classified as sports with normal starting and specialization ages, the proposed sampling path of the DMSP can lead to international top performances. Moreover, it can be assumed that in sports with a late start, athletes practiced other sports before starting their main sport (e.g., archery, shooting, cycling, boxing, canoe, wrestling, weightlifting). Therefore, opportunities for talent transfer to these sports should be explored Schmidt & Wrisberg (2000) concluded that movement skills, perceptual skills, conceptual skills, and physical conditioning are elements that could be transferable across sports. Future research should focus on the diversification phase and try to determine which sports have transferrable elements and lead to success in late starting sports. In each sport, NSOs should encourage the implementation of sport-specific developmental models with increased attention on the starting age, diversification period and specialization age. However, the results of this study highlight that there will always remain significant variation between individual athletes in each sport.

Diezemann, E. D. (2023). "Are long-term health effects on the musculoskeletal system to be expected from Olympic wrestling?" INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(1): 16-29.

The quote: "Great sport begins where it has long stopped being healthy" by Bertold Brecht, German dramatist, poet and storyteller is now irrefutable in sports medicine. We know that high-performance sports can lead to late damage to the motor apparatus. To what extent does this apply to Olympic Wrestling? Wrestling is one of the oldest forms of sports. Wrestling matches were held even in ancient Egypt around 3999 B.C. It was part of the program in the Olympic Games of antiquity and has remained so to the present summer games. Wrestling demands of the athletes appropriate condition combined with a high level of reactions and speed. This is impossible without a healthy cardiovascular system, healthy metabolism and a healthy motor apparatus. This results to a high level of sports-specific stress in the course of a wrestling career. Can this lead to irreversible late damage?

Dokmanac, M. (2023). "Qualitative statistical analysis of senior world wrestling championship 2022 - Belgrade (SRB)." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(1): 2-15.

By applying a new way of analyzing major world championships (Performance Data Analysis - PDA), a completely different approach is obtained in analyzing the wrestling championship. In the first phase of creating PDA, all video matches at the championship were reviewed and data on all segments of wrestling matches were recorded. In the next phase, a qualitative analysis of the wrestling techniques that were shown at the last senior world championship in 2022 in Belgrade (SRB) was made through a prepared platform called Performance Data Analysis - PDA.

Erdem, A., et al. (2023). "Examining mindfulness and moral disengagement in doping: Perspective of Turkish wrestlers." Frontiers in Psychology **14**.

Introduction Studies related to attitudes toward the use of prohibited substances in Turkish athletes are scarce. The World Anti-Doping Agency (WADA) has implemented anti-doping educational policies emphasizing doping-related education in studies conducted among Turkish wrestlers. However, it is still unclear the extent to which the wrestlers comply and adhere to these anti-doping policies. No research has previously examined the effect of anti-doping education on athletes' mindfulness and moral disengagement in doping (MDD). Therefore, the present study has a two-fold objective: first, to examine whether doping-related education (DRE) and the status of being a national athlete (NA) have an effect on athlete mindfulness and MDD. Second, to analyze the relationship between each sub-dimensions of athlete mindfulness: awareness (ASD), judgment (JSD), and refocus (RSD) with MDD. **Methods** A total of 409 male wrestlers participated in this study. MANOVA analysis showed that NA and DRE alone have no effect on MDD but have a general effect on mindfulness. **Results** The highest effect was on the ASD of being an NA (ηp2 = 0.173). When the interaction effect of NA*DRE was examined, significant difference in MDD (F = 8.218, p = 0.004), ASD (F = 8.476, p = 0.004), JSD (F = 5.844, p = 0.016), and RSD (F = 11.476, p = 0.001) were found. MDD has a weak negative relationship with ASD (r = −0.126) and RSD (r = −0.041) and a weak positive relationship with the JSD sub-dimension (r = 0.140). Those results suggest that being a NA and having received anti-doping education affect moral disengagement in doping and athletes' mindfulness. **Discussion** As a conclusion, it is recommended to increase awareness and anti-doping education among national-standard Turkish wrestlers to prevent them from engaging in doping behaviors.

Fatih, K. and A. Yener (2023). "Investigation of some injuries in freestyle and greco-roman style Turkish wrestlers." ROL Spor Bilimleri Dergisi.

The study's main purpose is to determine the disability status of elite Turkish wrestlers in the young and senior categories according to Freestyle and Greko-Romen wrestling styles and to determine the precautions to be taken to prevent possible injuries in today's wrestling. Fifty-eight wrestlers in Freestyle and 72 wrestlers in Greco-Roman style were followed. Student t-tests- and "chi-square" tests were used for statistical analysis. It has been determined that there is a difference in the injury exposure of the wrestlers during active sports according to the wrestling style (Chi square = 9.82, p

Ford, K., et al. (2023). "RETURN TO SPORT AFTER KNEE INJURIES IN COLLEGIATE WRESTLING." Iowa Orthopaedic Journal **43**(1): 131-135.

Background: Wrestling is known to be a sport of relatively high injury incidence, and knee injuries account for a large percentage of those injuries. Treatment of these injuries varies considerably depending on injury and wrestler characteristics, leading to variability in complete recovery and return to sport (RTS). The purpose of this study was to evaluate injury trends, treatment strategies, and RTS characteristics after knee injuries in competitive collegiate wrestling. Methods: NCAA Division I collegiate wrestlers who sustained knee injuries between January 2010 and May 2020 were identified using an institutional Sports Injury Management System (SIMS). Wrestling-related knee, meniscus, and patella injuries were identified, and treatment strategies were documented to investigate potential recurrent injury trends. Descriptive statistics were used to quantify the number of days, practices, and competitions missed, return to sport times, and recurrent injuries among wrestlers. Results: Overall, 184 knee injuries were identified. After excluding non-wrestling injuries (n=11), 173 injuries remained (77 wrestlers). The mean age at time of injury was 20.8 ± 1.4 years, and the mean BMI was 25.9 ± 3.8 kg/m2. There were 135 primary injuries (74 wrestlers), which consisted of72 (53%) ligamentous injuries, 30 (22%) meniscus injuries, 14 patellar injuries (10%), and 19 other injuries (14%). The majority of

ligamentous injuries (93%) and patellar injuries (79%) were treated non-operatively, while the majority of meniscus tears (60%) underwent surgery. Twenty-three wrestlers (22%) sustained recurrent knee injuries, of which 76% were treated non-operatively after their initial injury. Recurrent injuries consisted of 12 (32%) ligamentous injuries, 14 (37%) meniscus injuries, eight (21%) patellar injuries, and four (11%) other injuries. Fifty percent of recurrent injuries were treated operatively. When comparing recurrent injuries to primary injuries, recurrent injuries had a significantly longer return to sport time (Recurrent 68.3 ± 96.0 days vs. Primary 26.0 ± 56.4 days, p=0.01). Conclusion: The majority of NCAA Division I collegiate wrestlers who sustained knee injuries were initially treated non-operatively, and approximately one in five wrestlers sustained recurrent injuries. Return to sport time was significantly increased after a recurrent injury.
Level of Evidence: IV
Keywords: wrestling, knee injury, return to sport

Gallant, F., et al. (2023). "Puberty timing and relative age as predictors of physical activity discontinuation during adolescence." Sci Rep **13**(1): 13740.

Among same-age adolescents, those who enter puberty relatively later and those who are relatively younger (e.g., born later in the year) might be at greater risk of physical activity discontinuation. This study aimed to (1) describe gender-specific discontinuation, re-engagement, and uptake rates in various types of physical activities from the age of 11 to 17 years, and (2) assess puberty timing and relative age as predictors of discontinuation from organized, unorganized, individual, and group-based physical activities. Longitudinal data from 781 (56% girls, age 10-13 years at study baseline) Canadian participants who self-reported puberty status, birthdate, and involvement in 36 physical activities every four months from 2011 to 2018 was analyzed. The incidence of discontinuation, re-engagement, and uptake in organized/unorganized and individual/group activities from grade 6 until grade 12 was described and Cox proportional hazard models were used to estimate associations of puberty timing and relative age with organized/unorganized and individual/group activity discontinuation. Results demonstrate that individual and unorganized activities are maintained longer than group-based and organized activities. Girls who started puberty earlier were more likely to discontinue organized activities than girls with average-puberty timing [Hazard ratio (HR) (95% confidence interval (CI)) 1.68 (1.05-2.69)]. Compared to boys born in the 4th quarter of the year, boys born in the 2nd quarter of the year were less likely to discontinue organized [HR (95% CI) 0.41 (0.23-0.74)], unorganized [HR (95% CI) 0.33 (0.16-0.70)], group [HR (95% CI) 0.58 (0.34-0.98)], and individual activities[HR (95% CI) 0.46 (0.23-0.91)], and boys born in the 3rd quarter were less likely to discontinue unorganized activities[HR (95% CI) 0.41 (0.19-0.88)]. This study illustrates the patterns of physical activity participation throughout adolescence. However, the generalizability of findings may be limited due to participant representation.

Gee, T. I., et al. (2023). "Rapid Weight Loss Practices Within Olympic Weightlifters." Journal of Strength & Conditioning Research **37**(10): 2046-2051.

Rapid weight loss (RWL) practices are common among athletes to "make weight" for a chosen bodyweight class. This study's purpose was to investigate RWL prevalence, magnitude, and methods within Olympic weightlifters from Great Britain. Subjects (n 5 39, male 5 22, female 5 17) were recruited from International Weightlifting Federation lifting populations (mandatory two-hour competition weigh-in). Subjects were categorized into competitive groups based on Sinclair coefficient total (high, mid, low) and also gender (male, female). The validated Rapid Weight Loss Questionnaire was used to establish RWL magnitude and practices. Of respondents, 33 of 39 (84.6%) had purposely acutely reduced body mass to compete, a higher proportion present within females (94.1%) than males (77.3%). The cohort's mean habitual precompetition acute body mass loss was 3.8 6 1.7% and the "rapid weight loss score" (RWLS) was 23.6 6 9.5. Across competitive

groups there were no significant differences in habitual or highest precompetition body mass loss, postcompetition body mass gain or RWLS (p . 0.05). However, females attributed a significantly greater "highest" relative precompetition body mass loss compared with males (7.4 vs 4.9%, p 5 0.045). For RWL methods used, frequencies of "always" and "sometimes" were reported highest for "restricting fluid ingestion" (81.8%), "gradual dieting" (81.8%), and "water loading" (54.5%). The prevalence of RWL is high among competitive Olympic weightlifters, and especially within the sampled female athletes. Magnitude of RWL was similar across different standards of athlete; however, female lifters demonstrated a higher maximum precompetition RWL.

Gierczuk, D., et al. (2023). "Effects of Led Lighting Training on Response Time in Greco-Roman Wrestlers." Polish Journal of Sport & Tourism **30**(1): 11-16.

Introduction Response time is one of the determinants of performance effectiveness in wrestling competitions. Its high levels help wrestlers fight more effectively when performing appropriate technical and tactical actions. Different factors such as a proper warm-up, unexpected situations, muscle fatigue, asthenic reactions, competition prestige and previous injuries may exert an influence on perceptual abilities (including RT and MT) and affect fighting effectiveness. Getting to know determinants of response time may provide a lot of valuable practical information that can be used in wrestling-related training. The study sought to determine changes in response time in Greco-Roman wrestlers produced by LLT. Material and Methods Twenty-four Greco-Roman wrestlers (age = 18.6 1.8, years of experience = 6.0 1.6) took part in the study. The wrestlers were divided according to two weight classes (lightweight and heavyweight). Within LLT programme, they performed special motor tasks using Batak Pro (15 minutes in total). Between the tasks, response time (reaction time and movement time) was measured. Reaction time test (RT, version S1) of the Vienna Test System was used in the study. Results Response time changed in a variety of ways (different directions and intensity of changes). The changes were noted both in RT and MT. Contrary to LLT, a standard warm-up did not contribute to an improvement in RT. The greatest changes were observed after ten minutes of exercising. Intragroup differences in response time grew smaller in the course of the task performance. No differences in response time were noted between wrestlers representing different weight classes. Conclusions Physical exertion within LLT affects response time in Greco-Roman wrestlers regardless of their weight classes. The most favourable changes occur after 10 minutes of exercising that requires high attentional focus (exercises performed after a standard warm-up). The type of warm-up and the exercises used may constitute a factor improving performance effectiveness. It is recommended that in a pre-competition warm-up, more time should be devoted to exercises requiring high attentional focus.

Gierczuk, D. and Z. Wójcik (2023). "Physical fitness of highly qualified female and male wrestlers of various sports levels." Journal of Physical Education and Sport **23**(6): 1488-1494-1494.

Research on studying fitness preparation in wrestling in the context of fighting style, gender and weight category can provide valuable tips for training work. There is a small number of scientific publications in which an attempt was made to determine the physical fitness of highly qualified female and male wrestlers. The deficit of scientific studies taking into account the fitness profile is particularly noticeable in women's wrestling. The aim of the study was to determine the physical fitness of female and male freestyle wrestlers (both men and women) of various levels of sports advancement. Highly qualified female and male freestyle wrestlers in the junior and senior age categories took part in the study. Due to body weight, the female and male competitors were divided into two conventional groups: light and heavy ones. The tests included the assessment of physical fitness, taking into account: explosive power, strength endurance, agility, flexibility and special endurance. The level of sports advancement, weight category and gender differentiate the physical fitness of highly qualified male and female

freestyle wrestlers. Seniors of lightweight categories are characterized by higher values of special endurance than juniors of similar body weight. When divided into two weight categories, only in the case of male freestyle wrestlers in the senior category, differences in favor of competitors from lighter weight categories were visible in flexibility. Comparing physical fitness by gender, men dominated in explosive power, strength endurance, agility and special endurance, however women dominated in flexibility. The physical fitness of highly qualified female and male wrestlers varies according to the level of sports advancement, gender and weight category. Training groups at various stages of sports advancement should be created according to gender and weight category. In the motor preparation of female and male wrestlers of all weight categories, the leading components of physical fitness different for a particular gender should be emphasized in the first place. This should be taken into account in the selection of training measures aimed at specific components of physical fitness among female and male wrestlers.
Key Words: Wrestling, Fitness profiles, Sports advancement

Gkrekidis A., et al. (2023). "FREESTYLE WRESTLERS REACTION TIME DIFFERENCES BETWEEN DIFFERENT WRESTLING SPECIFIC VISUAL STIMULI AND KINETIC RESPONSES." International Journal of Wrestling Science **13**(2): 2-9.

PURPOSE of the current study was to examine the differences between the reaction time of wrestlers attacking the left leg, the right leg or both legs given a different kinetic visual stimulus. METHODS: The sample consisted of 19 wrestling athletes, male and female, who voluntarily participated in the research, seven were adolescent girls with an average age of 16 ± 1.95 years while 12 were young men with an average age of 20.27 ± 2.27 years. “Barbas3D Wrestling Dummy” was used to produce stimuli and to apply the responses to these stimuli on it. Two in-floor force plates were used, the athletes stood on them so that the first occurrence of force at the onset of the motor response after the stimulus was recorded. An extensometer attached to the dummy's ankles and an accelerometer placed on the dummy’s back were used to observe the timing of the onset of the stimuli during the measurement procedure. RESULTS: In all comparisons the “type of stimulus” factor showed statistically significant main effect with the mean reaction times of attacking the left leg being lower than the ones of attacking the right leg or both legs, also the mean reaction times when the attack occurred on the right leg were shorter than the ones of the attack on both legs. CONCLUSIONS: The different kinetic responses as well as the differences concerning the source of stimuli and the target of the response could be the major causes for the current results. More research is needed before we can safely assume that our results are valid for other wrestling athletes too as gender, age, physique, type and intensity of stimulus as well as the kinetic response critically influence reaction time.

Gomboev, B. B., et al. (2023). "Modern Trends in the Development of Women’s Wrestling." Journal of Siberian Federal University - Humanities and Social Sciences **16**(2): 263-273.

The history of the development of women’s wrestling as an Olympic sport is considered in the article from the point of view of the statistical indicator dynamics (the period 1985–2021): changes in the number of participating countries in international competitions and the number of athletes declared from each participating country. The analyzed competitions: the World Cup, the World Women’s Wrestling Championship and the Olympic Games. The purpose of the study is to assess the current state and development trends of women’s wrestling in the world. Analysis of scientific and methodological literature, statistical database processing United World Wrestling (UWW) – https://uww.org/. The indicators of the participating countries number in women’s wrestling international competitions and the number of athletes declared from each participating country were analyzed. The results obtained complement the theoretical section of the sports development history, the history of the Olympic Games and the wrestling development history. Describing the current state of women’s wrestling, it can be noted that this type of wrestling is developing in 186 countries of the world, including Africa – 47, South and North America – 33, Asia – 40, Europe – 48 and Oceania – 18. The

analysis revealed that the main trends in the development of women's wrestling in the world are the following directions: 1) the development of women's wrestling takes place within the sports wrestling development general history framework in the world, since women's wrestling competitions follow the rules of freestyle wrestling; 2) the development of women's wrestling as an independent sport (discipline) begins in the 1980s with the first international competitions and reaches its peak after being included in the program of the Olympic Games; 3) there is a high rate of the different countries women's wrestling development (first of all, an increase in the number of participating countries and athletes participating in world championships, and secondly, an increase in the list of countries participating at least once in the Olympic Games); 4) the holding of the Olympic Games leads to a sharp increase in the number of countries, since a significant increase in the number of countries developing women's wrestling was observed in 2008–2009 after being included in the program of the Olympic Games; 5) the achievement of the modern level of development of women's wrestling became possible in 30 years, but women's wrestling became the third female martial art (after judo and taekwondo) included in the program of the Summer Olympic Games. Statistical analysis confirms the need to maintain the Olympic status for this sport for further positive dynamics in the development of women's wrestling.

Guangcai, Q., et al. (2023). "Effects of two-week machine massage on muscle properties in adolescent wrestlers." Frontiers in Physiology **14**: 1-8.

Objective: This study aimed to investigate the effect of a two-week machine massage on the physical properties of the erector spinae and serum biochemical indexes of adolescent athletes after training. Methods: Sixteen male adolescent wrestlers were recruited (age: 15 ± 1 year; height: 166 ± 7 cm; weight: 56 ± 7 kg) and randomly assigned to machine massage (MA, 8) and control (CO, 8) groups. Participants in the MA group received machine massage for 20 min after each wrestling training from Monday to Saturday (except on Thursday) for two weeks, while the participants in the CO group recovered naturally. Over the course of two weeks, all the participants underwent similar wrestling training program under the guidance of a professional coach. Before and after the intervention, serum urea and creatine kinase (CK) levels were measured in a fasting state. A Myoton Pro digital muscle evaluation system was used to measure the physical properties of the erector spinae, including the oscillation frequency, logarithmic decrement of a muscle's natural oscillation, and dynamic stiffness. Results: After two weeks of machine massage treatment, the dynamic stiffness of the erector spinae in the MA group decreased by 12.90% and that in the CO group increased by 2.34%, indicating a significant difference between the two groups ($p = 0.04$, $\eta 2 = 0.286$). The decrease in the logarithmic decrement of a muscle's natural oscillation value in the MA was significantly greater than that in the CO ($p = 0.003$, $\eta^2 = 0.286$). Moreover, the serum CK values decreased by 33.84% in the MA group and by 1.49% in the CO group, despite a trend of change between the groups ($p = 0.062$, $\eta^2 = 0.084$). No significant difference was found in the improvement in serum urea levels between the two groups after two weeks of treatment. Conclusion: Results of the present study indicated that a two-week machine massage had a positive effect on the improvement of the physical properties of the erector spinae of wrestlers during training.

Gutiérrez-Santiago, A., et al. (2023). "The temporal structure of male freestyle wrestling bouts in 65, 86 and 125 kg categories." PLOS ONE **18**(3): e0282952.

In freestyle wrestling, how regulatory breaks and micro pauses affect the efforts during combat has been studied very little. The objective of the study was to determine the temporal structure of fights in male freestyle wrestling in the 65, 86 and 125 kg categories. All wrestlers from the categories (n = 115) who competed in the 2019 senior wrestling world championship (Nur-Sultan, Kazakhstan) participated. Using observational

methodology, we analyzed all fights (n = 127). We used different statistical techniques: descriptive, normality tests, Kruskall-Wallis, one-way ANOVA and chi-square. The significance level was ρ<0.05. The results show that most fights finish in the last minute (73.5% in 65 kg, 74.5% in 86 kg and 80.6% in 125 kg) and the total fight time is consumed (67.3% in 65 kg, 70.2% in 86 kg and 77.4% in 125 kg). Differences in 18 variables were found when comparing the three weights were found in the temporal and sequential parameters of the combat. When we compare these parameters to the different fight minutes, we find that there are differences in 17 variables in 65 kg, 20 variables in 86 kg and 10 variables in 125 kg. The results define a temporal structure of male freestyle wrestling bouts in the three categories, and therefore, it will be possible to prepare adequate trainings for these athletes. We conclude that in the three weight categories, they wrestle longer standing than while on the ground. There are clear differences between the three categories. In the 125 kg category, the temporal and sequential parameters are more stable throughout the different minutes of the fight, and in 65 and 86 kg, there is an instability. In the three weights, the regulatory break modulates the duration of the pauses and the actions performed by the wrestlers in different fight minutes.

Hammer, E., et al. (2023). "Association of in-competition injury risk and the degree of rapid weight cutting prior to competition in division I collegiate wrestlers." Br J Sports Med **57**(3): 160-165.

Objectives: Weight cutting is thought to offer a competitive advantage in wrestling. Dehydration has deleterious effects on physical and cognitive function, which may increase the risk of injury. The purpose of the study was to investigate whether the degree of weight cutting was associated with injury risk.; Methods: Data were collected prospectively in a cohort of collegiate wrestlers over seven seasons. Changes in weight, body fat and lean mass were measured during the preseason, at midseason and before competition. Cox proportional-hazard ratios were calculated for risk of in-competition injury.; Results: Among 67 unique division 1 collegiate wrestlers (163 athlete seasons), there were 53 unique injuries affecting 46 athletes. There was no difference in absolute weight change, per cent weight change, per cent body fat change or per cent lean mass change between injured and non-injured wrestlers from the preseason to midseason measurements. From midseason to competition weight, change in body weight was -7.0%±3.2% (-5.3 kg±2.6) in injured athletes compared with -5.7%±3.3% (-4.3 kg±2.5) in non-injured athletes. For every kilogram of body weight lost, wrestlers had a 14% increased hazard of injury (HR 1.14, 95% CI 1.04 to 1.25, p=0.004). For every 1% of body weight lost, wrestlers had an 11% increased hazard of injury (HR 1.11, 95% CI 1.03 to 1.19, p=0.005).; Conclusion: Rapid weight cutting was associated with a higher risk of in-competition injuries in division 1 collegiate wrestlers. For every per cent in body weight lost, wrestlers had an 11% increased hazard of injury during competition.

Herrera-Valenzuela, T., et al. (2023). "Relation between VT1, VT2, and VO 2max with the Special Wrestling Fitness Test in Youth Wrestlers: A Short Report." International journal of environmental research and public health **20**(3).

This study investigated the relationship between peak oxygen uptake and ventilatory threshold 1 (VT1) and 2 (VT2) with the Special Wrestling Fitness Test variables. Thirteen wrestlers (male: six; female: seven) of Olympic freestyle wrestling were assessed. The Pearson's correlation coefficient ($p < 0.05$) was used to establish the relationship between variables. A positive correlation was found between VT1 with throws in set B ($r = 0.77$; $p = 0.002$; 95%CI = 0.37-0.93), total throws ($r = 0.73$; $p = 0.004$; 95%CI = 0.30-0.91), heart rate recovery ($r = 0.58$; $p = 0.036$; 95%CI = 0.05-0.86), and test index ($r = -0.60$; $p = 0.031$; 95%CI = -0.86-0.07); between VT2 and throws in set B ($r = 0.57$; $p = 0.043$; 95%CI = 0.01-0.86); and between peak oxygen uptake with throws in set B ($r = 0.77$; $p = 0.002$; 95%CI = 0.39-0.93), throws in set C ($r = 0.64$; $p = 0.02$; 95%CI = 0.12-0.89), and total throws ($r = 0.72$; p

= 0.006; 95%CI = 0.28-0.91). In conclusion, the peak oxygen uptake and ventilatory thresholds correlated with specific Special Wrestling Fitness Test variables.

Hoffmann, J., et al. (2023). "Biomechanics of suplex in Greco-Roman wrestling: a qualitative and time-motion analysis of international competitions." International Journal of Performance Analysis in Sport **23**(1): 1-14.

The suplex is one of the most important and spectacular offensive moves in Greco-Roman wrestling, and wrestling in general, but to date no published biomechanical study has systematically described it. We performed a qualitative biomechanical analysis to classify variants of suplex, and to split this complex move into phases and actions within them. As suplex efficacy highly depends on speed of execution, we analysed 80 suplex throws from publicly available videos of international matches at the highest level to describe the duration of the different phases and actions, and how these vary across variants of suplex. We observed a preference for belly-to-belly vs belly-to-back and for lateral vs frontal variants of suplex. We show differences in duration of important phases/actions across variants, including the preparation phase (longer for belly-to-back variants) and the back arch in the projection phase (longer for frontal variants), while we find no evidence of a difference in the frequency of win by fall. Our study provides a useful framework to evaluate and monitor suplex execution, through information to help choose a variant in specific match contexts, a systematic description of its complex motion to allow a more focused training, and "gold-standard" durations of its movement components.

Huan, L. and L. Yuxing (2023). "EFFECTS OF HIGH-INTENSITY INTERVAL TRAINING ON THE ANAEROBIC CAPACITY OF WRESTLERS." EFECTOS DEL ENTRENAMIENTO POR INTERVALOS DE ALTA INTENSIDAD EN LA CAPACIDAD ANAERÓBICA DE LOS LUCHADORES. **29**: 1-3.

Introduction: Since the Wingate anaerobic experiment was proposed in the 1970s, it has come to be used as an important detection method to evaluate athletes' high-power sport capacity, the effect of training, and the training method. Therefore, it is often used to measure and evaluate the anaerobic work capacity of the human body. Objective: Analyze the effects of high-intensity interval training on the anaerobic capacity of male wrestlers. Methods: Professional wrestlers from a sports college were selected, as well as 30 college students majoring in physical education at a sports college, to compare the anaerobic power test. Results: When evaluated by the Wingate anaerobic experiment, the value level of anaerobic power of training effects is best reflected in the first 10 s of the wrestling anaerobic experiment. The 30 s Wingate mainly reflects the effect of wrestling training on human anaerobic power, but the evaluation of anaerobic capacity from this period was not evidenced. Conclusion: The Wingate anaerobic experiment is an important method for evaluating the level of wrestling training and can be used as a basis for evaluating the effect of training and the level of wrestling.

Introducción: Desde que se propuso el experimento anaeróbico de Wingate en los años 70, comenzó a utilizarse como un importante método de detección para evaluar la capacidad deportiva de alta potencia de los atletas, el efecto del entrenamiento y el método de entrenamiento. Por ello, se utiliza con frecuencia para medir y evaluar la capacidad de trabajo anaeróbico del cuerpo humano. Objetivo: Analizar los efectos del entrenamiento interválico de alta intensidad sobre la capacidad anaeróbica de los luchadores masculinos. Métodos: Se seleccionaron luchadores profesionales de una escuela de deportes, además de 30 estudiantes universitarios graduados en educación física en una escuela de deportes para comparar la prueba de potencia anaeróbica. Resultados: Cuando se evalúa mediante el experimento anaeróbico de Wingate, el nivel de valor de la potencia anaeróbica de los efectos del entrenamiento se refleja mejor en los primeros 10 segundos del experimento anaeróbico de lucha. El Wingate de 30 segundos refleja principalmente el efecto del entrenamiento de lucha en la potencia anaeróbica humana, pero no se evidenció la evaluación de la capacidad anaeróbica a partir de este

periodo. Conclusión: El experimento anaeróbico de Wingate es un método importante para evaluar el nivel de entrenamiento de lucha, y puede utilizarse como base para evaluar el efecto del entrenamiento y el nivel de lucha. (Spanish)

Ibarra, S. (2023). The Effect Cutting Weight Has on Bone Mineral Density in Male High School Wrestlers. Dissertation United States -- Tennessee, Middle Tennessee State University. **30420597:** 43.

Weight-bearing physical activities can promote bone mineral density (BMD), but wrestlers who maintain dietary restrictions to compete in a lower weight class may be at risk for low BMD. The relationship between BMD and body mass index (BMI), percent body fat (%BF) and weight classes, respectively, in male high school wrestlers was investigated in this study. Existing data from 137 male wrestlers were analyzed. Body composition and BMD measurements were analyzed via DEXA Hologic Discovery, height was measured via Seca Stadiometer, and weight was measured via Seca Digital scale. There were no statistically significant relationships between BMD and weight class ($\chi 2(12, N = 137) = 5.128a$, $p = .954$), BMD and BMI ($rpb = .103$, $n = 137$, $p = .231$), or %BF and BMD ($rpb= .007$, $n = 137$, $p = .934$). Although current data did not show a significant relationship with BMD, further on a potential relationship between low BMI and low BMD is needed. It is also important coaches and wrestlers are educated on balancing nutritional needs and weight.

Iliev, I. (2023). "COMPARATIVE ANALYSIS OF PERSONAL DISPOSITION IN FREESTYLE AND GRECO-ROMAN WRESTLERS." Trakia Journal of Sciences **21**: 502-507.

The purpose of the study was to reveal the characteristics of personal disposition by determining the goal orientation of wrestlers. The first study was conducted in 2023, and we compared these results with the results obtained from a study conducted in 2011. Sixty Freestyle and Greco-Roman wrestlers took part in the study. Methods: Task and Ego Orientation in Sport Questionnaire - TEOSQ was used. Variation analysis, descriptive statistics, and comparative analysis (the Mann-Whitney criteria) were applied. The mathematical and statistical processing packages IBM SPSS v 23.0 and Microsoft Office Excel 2016 were used. Results: The variation analysis of the experimental data showed that the subjects generally demonstrated a higher task orientation than ego orientation. The comparative analysis of the goal orientation between the groups showed that there was no statistically significant difference between them. As the orientation to the task prevailed over the ego orientation, this confirmed the hypothesis that in most of the studied persons, the goal orientation was aimed at the masterful performance of the tasks. Conclusion: The obtained data are of essential importance for increasing the effectiveness of sports training, as the conducted research expands the picture of sports activity with the manifestations of goal orientation and its reflection on the personality qualities of wrestling competitors.

Ito, S., et al. (2023). "POSSIBLE ROLE OF EACH ARM IN WRESTLING TIE-UPS." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(2): 14-18.

Leg attacks are the most important skill in wrestling. We defined a scenario wherein wrestlers push or pull their opponents to execute a setup and leg attacks as a “tie-up.” In tie-ups, the wrestlers use their arms to gain control over their opponents; however, little is known about the role of each arm in this tie-up. This study clarifies how wrestlers use their arms during tie-ups. We surveyed 120 Japanese collegiate wrestlers using a questionnaire. The survey items covered how wrestlers used their near arm (NA) and far arm (FA) in tie-ups, and their competition level. The chi-square test was used to investigate the relationship between arm use and competition level as

well as opinions related to the NA and FA. There was no significant association between wrestler arm use and competition levels regarding the NA and FA. Regarding arm use, pushing was considered important for the NA, while pulling was considered important for the FA ($p<0.001$). In the free description questionnaire for the NA, keywords such as “sensing the opponent's movement,” “measuring the distance to the opponent,” and “touching the opponent” appeared frequently; for the FA, most keywords were related to “pulling movement.” Wrestlers use the NA to push the opponent and sense their movement and the FA to pull the opponent. It is essential for wrestlers practicing the setup and overall movement during tie-ups.

Ivica, B., et al. (2023). "Effects of Age and Popularity of Sport on Differences among Wrestlers’ Parental Support: An Exploratory Study." Journal of Functional Morphology and Kinesiology **8**(2): 65-65.

No research was previously performed on wrestling related to parental support. It is not known whether there are differences in support between younger and older children. The popularity of a sport can be reflected in parental support, and parents may be more inclined towards popular sports. The aim of this research was to examine differences in parental support among wrestlers of different age categories and between those coming from communities in which wrestling is a popular sport versus communities in which it is less popular. The sample of participants consisted of 172 wrestlers. The Parental Support Scale for Children in Sports was applied. Parental willingness to set an example was lower. As far as age is concerned, the period of entry into specialisation is sensitive. At this age, children perceive less parental support ($p = 0.04$) and lower parental belief in the benefits of sports ($p = 0.01$). The popularity of the sport is related to parental support. In environments in which wrestling is popular, parents know the sport better and can participate; therefore, children perceive more parental support. The findings of this study may help coaches to better understand athlete–parent relationships.

Kahraman, Y. and I. Varol (2023). "Acute investigation of maximal strength, power and rapid strength production on lower compartment circuit resistance training of international female wrestling athletes." International Journal of Physical Education, Fitness and Sports **12**(3): 40-47.

The circuit resistance training is high intensity and high load repetition training method completed on different sport modalities for wrestling women. A total of 10 wrestling women age mean 17 yr, height 1.63 m, body mass 54 kg, training experience 10 yrs participated in this study. Equipment and methods: To circuit resistance training determined on 1RM maximal test, gradually increase rapid strength production and lower leg power to CMJ and SJ actualized on six resistance exercises; a) hip flexion (HP), b) ankle inversion (AI), c) squat (SQ), d) hip extension (HE), e) deadlift (DE), and f) ankle eversion (AE) for wrestling women athletes on team professional sport performance. The lower compartment circuit resistance training was provided on advanced maximal load and power performance by 85% of 1RM (6 rep) high training load and (10 repetition - 20 s interval) intensity. Compared to Pre-test and Post-test that lower compartment resistance training concluded increased maximal strength for acute training load repetition and rapid strength load lifting performance and lower leg power resulted to CMJ decreased for wrestling and SJ increased for wrestling, circuit resistance training promoted high resistance load variability and minimum short time recovery on the one session non-periodic exercises performance with strength and power development. Other, experimental results for different sport modalities may be performing on maximal strength and power performance change in short recovery training phase for minimum effort rapid strength performance.

Kerimov, F. A., et al. (2023). "MODERN METHODS OF ASSESSING AND PREDICTING WEIGHT INDICATORS IN QUALIFYING AND ORIENTATION FOR SPORTS WRESTLING." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(2): 18-23.

Purpose: To develop a sample weight-height index based on the prediction of age-related growth of height in the
selection and early orientation of sports wrestling types.
Methods: Methods such as analysis of scientific-methodical literature, pedagogical observations, pedagogical testing, pedagogical experience, instrumental method, as well as mathematical-statistical analysis of the results of the research were used in the study. Level of study of the subject: According David Curby, Baum R.M, Platonov V.N, Fukuda D , Kelly J, Albuquerque M, Stout J, & Hoffman J, on the issue of selection and orientation from foreign scientists to sports wrestling classes and. Kerimov F.A., Khalmukhammedov R.D., Tajibaev S.S., Mirzanov Sh.S., Mirzaqulov Sh.A., Artikov Z.S., Matnazarov X.Y. and other scientists from our country on the issue of qualifying for sports wrestling and early detection of abilities, they conducted scientific research on the selection of Sports and wrestling types. To develop an effective system of sorting and directing future wrestlers to different weight weights based on the definition of model descriptions (weight-height indexes) for those engaged in sports wrestling of weight-height indicators of highly qualified wrestlers in the selection and orientation of children to different stages of long-term training in the selection and orientation of sports wrestling.

Kerimov, F. A., et al. (2023). "TRANSFORMATION OF DIGITAL TECHNOLOGIES IN THE TRAINING SYSTEM OF HIGHLY QUALIFIED WRESTLERS." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(2): 24-31.

PURPOSE: This study is an example of a significant contribution to the system of modern sports training of highly qualified wrestlers through the transformation of digital technologies in the training process.
METHODS: wrestlers (n=28) of high qualification participated as subjects. The qualitative kinematic characteristics of the speed-strength indicators (SSI) of individual muscle groups of various body segments were recorded using a universal dynamographic stand. Recording of speed-strength indicators was carried out with the help of a specially developed and patented program for the analysis of special strength indicators of athletes "Sila - 1"(strength). The coefficients of multiple correlations were also calculated as a measure of contingency between the physical, technical and functional training of wrestlers.
RESULTS: showed that in the course of the experiment, using quantitative instrumental methods by objective recording of the qualitative kinematic characteristics of the speed-strength indicators of individual muscle groups of various body segments in the experimental groups at the end of the experiment, despite the identity of the rates of development of the studied initial indicators of the SSI of highly qualified wrestlers, we observe all normative indicators of the experimental group have higher results, as evidenced by the arithmetic mean of these values, as well as the significance of the difference (<0.01).
CONCLUSION: it was revealed that the transformation of digital technologies in the training process of highly qualified wrestlers is a new promising methodological approach of the modern system of sports training. The use of quantitative instrumental methods of objective registration of individual muscle groups of various body segments in sports training determines the dynamics of the athlete's condition. This information can help the coach make timely adjustments to the athlete's individual card, necessary to improve the motor potential of wrestlers and their performance, which in turn will have a positive effect on the ability of athletes to effectively demonstrate special strength qualities in specific technical and tactical actions, both in the training process and in the competitive period.

Kolimechkov, Stefan, et al. (2023). "Tabata protocol-based high-intensity interval training in freestyle wrestlers." Pedagogy of Physical Culture and Sports **27**(6): 467-473.

Background and Study Aim. The physical attributes of muscular strength and endurance are essential for wrestlers to perform successfully. For the development of these physical qualities, high intensity interval training (HIIT) using kettlebell strength exercises is appropriate. The purpose of this study was to develop a kettlebell HIIT program for wrestlers and evaluate the results on strength and endurance. Material and Methods. Eight freestyle wrestlers who participated in the Bulgarian Wrestling Championships (age: 22.0±2.17 years, wrestling experience: 9.9±2.80 years) were included in the study. Measurements included height, weight, 8 circumferences, 8 skinfolds, and BMI, body fat percentage (%BF), and skeletal muscle mass percentage (%SMM). The wrestlers engaged in an HIIT circuit that involved four rounds of 16 kg kettlebells and eight exercises, each lasting 20 seconds to complete and 10 seconds to recover between. Polar H7 was used to continually record heart rate (HR). At rest, before, immediately after, and 15 minutes after the HIIT, blood lactate concentration (La) was assessed. Each exercise's number of repetitions was noted. Results. The wrestlers' average height was 175.2±7.45 cm, their average weight was 85.1±13.38 kg, and their average BMI was 27.6 kg/m2. The SMM was 42.1±2.39%, and the BF was 10.3±3.98%. Heart rate (HR) exhibited a pattern of elevation from rest to warm-up and during circle 1 to 4, followed by a decrease 10 minutes after HIIT. Lactate levels (La) displayed an upward trend from rest to before HIIT, a significant increase after HIIT, and a decrease 15 minutes after HIIT. Conclusions. As shown by the fact that each wrestler's HR during the kettlebell HIIT was above 75% of HRmax and that La was above the anaerobic threshold (>4 mmol/L), the created kettlebell HIIT, when used 5 times per week for eight weeks as part of the wrestlers' training, can improve their endurance.

Konrath, S. L. and D. R. Wagner (2023). "Survey of National Collegiate Athletic Association Athletic Trainers' Administration of the National Wrestling Coaches Association Weight Certification Program." International Journal of Athletic Therapy and Training **28**(3): 151-155.

Despite implementation in 1997, published research detailing the administration of the National Collegiate Athletic Association's minimum weight certification program is lacking. This survey aimed to determine how athletic trainers administer this program. Thirty-five of 77 (45.5% response rate) athletic trainers for National Collegiate Athletic Association Division I wrestling programs responded. Most (74.3%) had ≥5 years of experience measuring body composition, and nearly all (97.1%) used skinfold calipers. Caliper type varied, but everyone used the same measurement sites and procedure to estimate minimal weight. There appears to be consistency in the administration of minimal wrestling weight standards across National Collegiate Athletic Association Division I programs.

Korobeynikov, G., et al. (2023). "USE OF HEART RATE VARIABILITY IN THE TRAINING OF ELITE WRESTLERS." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(2): 32-37.

One of the methods of training support for elite wrestlers is the assessment of the objective state of the body. Training and competition are interconnected by psycho-emotional factors that can affect the effectiveness of sports activities (Périard et al, 2015; Pryimakov et al, 2016). Considering that psychophysiological functions constitute the most important link in the formation of psychoemotional response in situations of extreme states, it is logical to expect a connection between stress resistance and indicators of perception and information in elite wrestlers (Radchenko 2012; Korobeynikov et al, 2021). As is known, the physiological reaction to the extreme conditions of the competition is characterized by the psychoemotional stress of athletes (Chernozub et al., 2019). A number of works indicate that stress resistance affects the ability to endure training loads and the ability to trainelite athletes (Freitas et al, 2013). The cause of stress is a multifactorial stimuli that affects the decrease in the

performance of athletes (Gustafsson et al, 2017). The leading cause the decline in performance is the imbalance between stress and recovery after training (Hartmann et al, 2000). One of the main links in the stress response during emotional stress is the autonomic nervous system (Laborde et al, 2018). In previous studies, the results of the relationship of adaptive response to intense physical and emotional stress were obtained (Korobeinikov et al., 2021). The mechanism of stress resistance and coping in the psychoemotional state of competitive activity has been studied (Barbas et al., 2011). Traditionally, one of the indicators of stress in the psycho-emotional state is heart rate variability. In response to a competitive, stressful situation, a functional system is formed that provides muscular activity in highly qualified wrestlers (Theophilos et al., 2011). Modern Olympic wrestling is spectacular with a high intensity of competitive fight. This is a situation related to changes in United World Wrestling competition rules over the past ten years (Dokmanac et al., 2018). In this regard, the need to revise the systemic preparedness of elite wrestlers is very urgent. In addition, an increase in the intensity of competitive activity leads to a tension in the physiological regulation of the body in athletes (Kerimov et al., 2019). Therefore, studying the physiological mechanisms of the stress response of heart rate variability in competitions among elite wrestlers is of great importance. In addition, the development of a method of objectively monitoring the actual condition of elite wrestlers is a key direction in optimizing the training process. Therefore, the study of the stress response mechanisms of heart rate variability is of great importance for the training of elite wrestlers.

Krawietz, B. (2023). Oil over Turkey: UNESCO's Kirkpinar wrestling in Edirne. Indigenous, Traditional, and Folk Sports: Contesting Modernities**:** 23-36.

Men-only oil wrestling (yağlı güreş) counts as the most authentic national sport in otherwise soccer-crazy Turkey. Its main outdoor festival venue in the city of Edirne (Kırkpınar Festival) in the very west of the country was elevated to UNESCO Intangible Cultural Heritage status in 2010. It is allegedly the longest continuously practiced sports on earth apart from the Olympic Games. To pay tribute to the historical depth, cultural, and ethnic diversity of this type of freestyle wrestling, one has to look way beyond the confines of the modern Turkish Republic in time and space. The latter was founded only in 1923 out of the long-since waning Ottoman Empire that in its heyday had dominions on three continents. However, the tribe that started the Ottoman dynasty at the end of the thirteenth century like most of the other tribes of Anatolia had migrated there from Central Asia. The decisive element of olive oil that needs to be applied to the whole body was adopted from the Greco-Roman tradition when the young Ottoman Empire expanded westwards.

Krešo, Š., et al. (2023). "What Determines the Competitive Success of Young Croatian Wrestlers: Anthropometric Indices, Generic or Specific Fitness Performance?" Journal of Functional Morphology and Kinesiology **8**(3): 90-90.

Identifying factors influencing wrestling performance is important for determining which capacities should be developed the most. This research aimed to investigate whether anthropometric indices, generic fitness, and specific fitness performance determine the competitive success of young wrestlers. This research included 49 Croatian Greco–Roman male wrestlers aged 17.75 ± 1.51 years. Variables included training and competing experience, anthropometric indices, generic fitness (countermovement jump and handgrip strength), and specific wrestling fitness test (SWFT). Wrestlers were separated into medalists and non-medalists (i.e., wrestlers who won a medal at the previous National Championship and wrestlers who did not win a medal, respectively). The t-test for independent samples was used to determine the differences between the two categories in all variables. Moreover, discriminant analysis was performed to identify differences in a multivariate manner. Medalists and non-medalists did not differ in anthropometric indices and wrestling experience. Medalists had better results in the countermovement jump ($t = 2.55$, $p < 0.01$), handgrip strength ($t = 2.77$, $p < 0.01$), and SWFT performance ($t = 2.29$, $p < 0.05$) than non-medalists. The discriminant analysis confirmed that

performance categories differed in generic and specific fitness tests (Wilks' Lambda = 0.73, $p < 0.05$). It could be suggested that coaches should develop both the generic and specific fitness of their wrestlers to become more successful at competitions.

Kruszewski, A. (2023). "Antique wrestling is the prototype of a relatively gentle and honourable self-defence." ARCHIVES OF BUDO SCIENCE OF MARTIAL ARTS AND EXTREME SPORTS **19**: 5-10.

There is no evidence of self-defence schools in ancient Greece, but there are many historical accounts indicating the military references of the wrestling tradition. The primary place for wrestling training in the Greek system was the Palestras. Nowadays, however, numerous methods of self-defence derived from martial arts of various cultures are promoted, and a significant increase in interest in this type of physical activity has to do with the emergence of so-called action cinema. Wrestling combat techniques (especially throws, i.e. those used in a vertical stance) qualify as relatively benign forms of self-defence if they are used precisely in circumstances of necessary defence (abstracting from the use of wrestling as a means of aggression). Wrestling fighting techniques used in a horizontal stance are definitely safer. A denial of the ancient form of wrestling and the continuation of this tradition especially by the Greco-Roman style (also as an alternative self-defence option) is professional American pro-wrestling. At the height of the Covid-19 pandemic, the show was advertised as an essential service alongside hospitals, law enforcement and grocery shops (State of Florida, April 2020). One of the first public presentations took place in May 2021 (Stadium Stampede) as a combination of film footage and live wrestling. In extreme circumstances, the inadequate motor response of the attacked subject (or those standing in defence of him or her) to an attack by the aggressor ends either in the loss of life of those who have the right to defend themselves or of the aggressor. In the second case, there are two possible interpretations: it is the defending party who either exceeded the legal criteria of necessary defence (the counteraction was inadequate to the threat), or who was competent and determined enough to thwart an unauthorised direct attack, the evident purpose of which was to deprive the life of the attacked subject. Therefore, the simplest method of preparing a person from an early age for relatively gentle and honourable self-defence is for physical education teachers to use, among other things, fun forms of wrestling. The methodological template is the offer of innovative agonology based on the fun forms of fighting in the vertical posture and fun forms of fighting in the horizontal posture.

Kruszewski, A. (2023). "Wrestling fight – between tradition, sport and spectacle." Archives of Budo **19**: 21-27-27.

In ancient times, two forms of hand-to-hand combat were cultivated in parallel only partly with one compatible goal – a spectacle to attract the attention of crowds. Healthy emotions and positive social role models were provided by fights based on relatively mild methods and means of achieving a wrestling-type victory. In contrast, boxing and pankration were bloody spectacles that contradicted the ideals of wrestling-type fights. While in Western culture wrestling forms have been forgotten for nearly 1,500 years, in Far Eastern culture they have guided the development of successive generations by combining physical development with the embodiment of wisdom. This practice, through the unique pupil-master bond, is combined with a duty of respect for the elderly that is also evident today. The revival of the Modern Games in the 19th century and the creation of the Olympic Charter in 1914 brought about a renewal of the Olympic idea, based on thoughts developed by the ancient Greek philosophers. This gave a new impetus to the development of the society of Western culture; respect for the opponent, the values of equal opportunity and fair play were to contribute to mutual respect for all mankind. In the early days, this development was in line with the idea of the rediscovered values of the development of spirit and body, goodness and wisdom. Now, once again (as in the era of the Roman Games), widespread social prosperity, the pursuit of profit by satisfying the shallow needs of society in the age of the

internet and televised spectacle have led to the promotion of sham and neo gladiatorialism. Once again, virtues such as moderation and frugality have been supplanted by greed and addiction to pleasure. We are becoming a society of free time, consumption, fun and lack of morals.

Kurashova, N. A., et al. (2023). "Changes in the oxidative-antioxidant status of blood in freestyle wrestlers under the influence of physical exertion." Спортивная медицина: наука и практика (*Sports medicine: research and practice*) **13**(3): 30-36.

Purpose of the study: to evaluate the “lipid peroxidation-antioxidant protection” system in freestyle wrestlers under the influence of intense physical activity in order to identify the nature of oxidative processes and the antioxidant status of the athletes’ body. Materials and methods: the study involved athletes — freestyle wrestlers, boys 18–22 years old, with sports qualifications: candidate master of sports or master of sports, regularly involved in freestyle wrestling. The control group consisted of students who did not have a sports category and were not involved in sports activities, comparable in gender, age, weight category with the comparison group. The material for the study was plasma and red blood cells. Blood sampling from athletes was carried out twice, at the end of the preparatory and competitive periods, in the morning, on an empty stomach from the ulnar vein, in accordance with generally accepted requirements. Components of lipid peroxidation and antioxidant defense were determined using spectrophotometric and fluorometric methods. Results: it was found that in athletes after intense physical activity (competitive period), there is a significantly significant decrease in substrates with double bonds by 61 %, primary products by 59 % and intermediate products by 44 %, an increase in the final products of lipid peroxidation by 25 % against the background of inhibition activity of antioxidant protection components: retinol by 40 %, superoxide dismutase by 7 % and reduced glutathione by 11 %. Conclusion: The level of free radical processes increases during physical activity due to the accumulation of oxygen in organs and tissues, and depends on the intensity and duration of the exercise. In the course of the study, it was established that the preparatory and competitive periods, in comparison with the control group, among freestyle wrestlers, depending on the previous level of physical activity, are characterized by activation of lipid peroxidation processes and inhibition of enzymatic and non-enzymatic components of antioxidant protection. The established changes are recommended to be taken into account when conducting comprehensive rehabilitation of athletes, when developing recommendations for improving the training process, as well as when using antioxidant complexes for athletes aimed at restoring various parts of the body’s antioxidant defense.

Kurova, A., et al. (2023). "Dispositional optimistic and pessimistic mental states of young athletes: gender differentiation." Journal of Physical Education & Sport **23**(4): 857-867.

The purpose was to compare the researched parameters based on gender differentiation and to determine young athletes' dispositional optimistic and pessimistic mental states. The study's participants were young people aged 15 to 19 years (M=17.03; SD=±3.98), who regularly practiced sports and competed in all-Ukrainian and international sports tournaments. Respondents were divided into two groups based on gender: Group 1 - female representatives: handball, athletics (n=102; 55.74%); Group 2 - male representatives: football, freestyle wrestling, and weightlifting (n=81; 44.26%). Methods: valid and reliable psychodiagnostic methods used in sports research and standard purposeful non-participant observation. The following tests and coefficients were used to assess statistical reliability: H-test of Kruskal-Wallis, Spearman correlation parameters (rs), ranking (Rg), and factor analysis ANOVA. Results. The H-test of Kruskal-Wallis revealed differences in the studied parameters, disclosing that junior female athletes (Group 1) outperformed in (CN (H=7.717; p=.005), SSS (H=14.049; p=<.001) and PR (H=7.996; p=.005). Junior male athletes (Group 2) prevailed for GAL (H=9.041;

p=.003) and DS (H=11.686; p=<.001). The correlation analysis revealed sixteen statistically significant associations. The ranking recorded the same first position in both samples: Group 1 - Op (Rg1; rs=.989) and Group 2 - Op (Rg1; rs=.982), and then the parameters were arranged differently. It was discovered that there was a statistically significant influence of negative relations of dispositional optimism/pessimism with protective mechanisms in stressful situations of the sports activity - Group 1: DS (Rg2; rs=-.982), CN (Rg4; rs=-.967), Ps (Rg9; rs=-.929) and Group 2: Ps (Rg7; rs=-.902). The subjects' dispositional optimistic and pessimistic mental states were constructed into two-factor structures. The following mental states characterized the sample population of junior female athletes (Group 1): F1G1 - "Value-meaning disposition"; F2G1 - "Responsible and expected disposition"; F3G1 - "Protective-avoidant disposition". A group of junior male athletes (Group 2) demonstrated the following mental states: F1G2 - "Value-meaning disposition"; F2G2 - "Responsible and expected disposition"; F3G2 - "Distant-confrontational disposition". Conclusions. It is summarized that timely differentiation and identification of dominant mental states by coaching staff and athletes themselves can significantly increase sports psychological literacy, and affect not only local sports results but also the planning of a sports career and life position.

Kuvanov, V. A., et al. (2023). "Influence of physical qualities on the efficiency of competitive activity of freestyle wrestlers." Theory and Practice of Physical Culture(3): 9-11.

Objective of the study was to establish the dependence of the success of competitive activity on the level of development of the physical qualities of student freestyle wrestlers. Methods and structure of the study. 112 students from four universities of St. Petersburg involved in freestyle wrestling took part in the scientific experiment. The following scientific methods were used in the work: theoretical analysis and generalization of data from special scientific and methodological literature, questioning, pedagogical observation (stenography, timing of fights and training sessions), testing, instrumental methods for assessing various aspects of readiness, methods of mathematical statistics. Results and conclusions. The conducted correlation analysis made it possible to determine a group of indicators of special physical fitness, which largely determine the success of the competitive activity of student freestyle wrestlers. This complex included indicators of the quantity, quality and time of throws in special tests.

Kuźmicki, S., et al. (2023). "The effects of body mass reduction on the anaerobic power and selected somatic characteristics of Greco-Roman wrestlers." Biomedical Human Kinetics **15**(1): 35-42.

Study aim: The aim of the study was to determine the effects of body weight loss on the levels of somatic features and peak power of senior Greco-Roman wrestlers from the Polish national team. *Material and methods*: The study included 14 males, i.e. 7 wrestlers reducing their body weight and 7 wrestlers not changing their body weight. Seven days prior to a competition, the study participants began a 5-day process of losing body weight. The process involved reducing caloric intake from 3460 ± 683.1 kcal to 2160.0 ± 423.5 kcal per day. *Results*: Over the period of 5 days, the participants reduced their body weight by 3.1 ± 0.7 kg ($p < 0.001$). There occurred a decrease in the value of endomorphy ($p < 0.01$) and mesomorphy ($p < 0.05$) and an increase in the value of ectomorphy ($p < 0.001$). Peak power did not change (1296 ± 100.9 W on day 5 of the examination), nor did relative peak power (19.9 ± 1.1W/kg). *Conclusions*: In wrestlers 5-day rapid weight loss protocol may result in decrease of body circumferences and consecutive changes in somatic type without concurrent loss in lower-limb peak power.

Kuznetsov, A. S., et al. (2023). "Psychological training of wrestlers taking into account the types of temperament at the pre-competitive stage." Theory and Practice of Physical Culture (2): 58-61.

Objective of the study was to determine the influence of the psychological training of Greco-Roman wrestlers on the basis of taking into account the types of temperament at the pre-competitive stage of the training process. Methods and structure of the study. In a scientific experiment conducted with the help of a questionnaire, 30 sportsmen took part, engaged in Greco-Roman style wrestling, stages of improvement of sports skills and higher sports skills. To determine the types of temperament of spores, we used G. Eysenck's test. Results and conclusions. In the Greco-Roman wrestlers of the experimental group, under the influence of the developed methodology on the basis of taking into account individual peculiar properties of the psyche at the pre-competitive stage, the state of mental readiness of the wrestlers changed statistically significantly with a confidence probability q= 0.95. The data obtained testify to the need for purposeful work to improve the sports training of Greco-Roman style wrestlers, taking into account the individual properties of the psyche.

Liebel, S. W., et al. (2023). "Sport-Specific Recovery Trajectories for NCAA Collegiate Athletes Following Concussion." Annals of Biomedical Engineering: The Journal of the Biomedical Engineering Society: 1-9.

The recovery trajectories of collegiate athletes with sport-related concussion (SRC) are well characterized in contact/collision sports but are less well understood in limited contact sports with lower risk, reducing the ability of clinicians to effectively manage the return-to-play (RTP) process. The current study investigated the time to asymptomatic and RTP across a broad range of male and female collegiate sports and sought to group sports by recovery intervals. Data from the Concussion Assessment, Research and Education (CARE) Consortium included 1049 collegiate athletes who sustained a SRC while participating in game or practice/training of their primary sport. Injury setting and subsequent clinical presentation data were obtained. Survival analysis using the Cox Proportional Hazard model estimated the median recovery times for each sport. Optimal univariate K-means clustering grouped sports into recovery categories. Across all sports, median time to asymptomatic following SRC ranged from 5.9 (female basketball) to 8.6 days (male wrestling). Median RTP protocol duration ranged from 4.9 days (female volleyball) to 6.3 days (male wrestling). Median total RTP days ranged from 11.2 days (female lacrosse) to 16.9 days (male wrestling). Sport clusters based on recovery differences in time to asymptomatic (3) and RTP protocol duration (2) were identified. The findings from this study of a large sample of more than 1000 NCAA collegiate athletes with SRC show there exists ranges in recovery trajectories. Clinicians can thus manage athletes with similar guidelines, with individualized treatment and recovery plans.

Liu, H. and Y. Li (2023). "EFFECTS OF HIGH-INTENSITY INTERVAL TRAINING ON THE ANAEROBIC CAPACITY OF WRESTLERS." Revista Brasileira de Medicina do Esporte **29**.

Introduction: Since the Wingate anaerobic experiment was proposed in the 1970s, it has come to be used as an important detection method to evaluate athletes high-power sport capacity, the effect of training, and the training method. Therefore, it is often used to measure and evaluate the anaerobic work capacity of the human body. Objective: Analyze the effects of high-intensity interval training on the anaerobic capacity of male wrestlers. Methods: Professional wrestlers from a sports college were selected, as well as 30 college students majoring in physical education at a sports college, to compare the anaerobic power test. Results: When evaluated by the Wingate anaerobic experiment, the value level of anaerobic power of training effects is best reflected in the first 10 s of the wrestling anaerobic experiment. The 30 s Wingate mainly reflects the effect of wrestling training on human anaerobic power, but the evaluation of anaerobic capacity from this period was not evidenced. Conclusion: The Wingate anaerobic experiment is an important method for evaluating the level of wrestling training and can be used as a basis for evaluating the effect of training and the level of wrestling. *Level of evidence II; Therapeutic studies - investigation of treatment outcomes.*
Keywords: High-Intensity Interval Training; Exercise; Endurance Training.

Maltsev, I. Y. (2023). "Fight tactics in wrestling." Scientific Notes of P.F. Lesgaft University **1**(215): 297-301.

The article discusses the concept of "tactics" of wrestling, presents the tasks of individualizing the training of wrestlers and the structure of the tactics of the duel and it analyzes the key factors that directly affect the process of the duel, studies examples that clearly demonstrate one or another factor. Practical significance of the work - the studied tactical and tactical actions will allow wrestlers to make effective decisions, plan their actions correctly and achieve sporting success.

Marigi, E. M., et al. (2023). "Surgical Stabilization for Recurrent Patellar Instability in Competitive Wrestlers: Outcomes, Reoperations, and Return to Play at 6-Year Mean Follow-up." American Journal of Sports Medicine **51**(10): 2608-2616.

Background: The extent to which recurrent patellar instability (RPI) affects wrestlers has not been thoroughly examined. Purpose: To assess return to wrestling (RTW), patient-reported outcomes, and reoperation rates after patellofemoral stabilization surgery (PFSS) for RPI in a cohort of competitive wrestlers. Study Design: Cohort study; Level of evidence, 3. Methods: All competitive wrestlers with a history of RPI and subsequent PFSS performed at a single institution between 2000 and 2020 were identified. Primary PFSS procedures included medial patellofemoral (MPFL) reconstruction (n = 31; 50%); MPFL repair (n = 22; 35.5%); or other PFSS (n = 9; 14.5%), such as tibial tubercle osteotomy, lateral retinacular release, and/or medial retinacular reefing. Exclusion criteria included revision PFSS or concomitant anterior cruciate ligament reconstruction or multiligament knee injury. Surgical failure was defined as subsequent patellar dislocation despite operative management or need for secondary PFSS. Results: Ultimately, 62 knees in 56 wrestlers with a mean age of 17.0 years (range, 14.0-22.8 years) were included at a mean follow-up of 6.6 years (range, 2.0-18.8 years). RTW occurred in 55.3% of wrestlers at a mean ± SD 8.8 ± 6.7 months. Among PFSS types, no differences were observed in rates of RTW (P =.676), postoperative pain (P =.176), Tegner activity level (P =.801), International Knee Documentation Committee (P =.378), Lysholm (P =.402), or Kujala scores (P =.370). RPI was the most common postoperative complication (n = 13; 21.0%). MPFL reconstruction had the lowest rate of RPI (6.5% vs 27.3% [repair] vs 55.6% [other]; P =.005) and surgical failure (9.7% vs 31.8% [repair] vs 55.6% [other]; P =.008). Kaplan-Meier survivorship free from surgical failure of the entire cohort was 91.9% at 1 year, 77.7% at 5 years, and 65.7% at 15 years. MPFL reconstruction had the highest survivorship when compared with MPFL repair and other PFSS up to 10 years after the index surgery (90.3% vs 64.1% vs 27.8%; P =.048). Conclusion: RPI remains a concern for competitive wrestlers after PFSS. MPFL reconstruction may serve as a more durable surgical treatment option with lower rates of RPI and failure when compared with other PFSS procedures at up to 10 years after surgery.

Mojtahedi, D., et al. (2023). "Competition Anxiety in Combat Sports and the Importance of Mental Toughness." Behavioral Sciences (2076-328X) **13**(9): 713.

Combat sports require participants to engage in potentially dangerous forms of contact-based competition. Pressure to succeed, coupled with the risk of severe injury can induce significant levels of anxiety, which if uncontrolled, can negatively impact performance and possibly promote unsporting conduct. The present study examined competitive anxiety levels of combat sports athletes and determined whether self-reported scores were associated with mental toughness and Sportspersonship attitudes. A cross-sectional survey design was used whereby participants (N = 194) completed a battery of questionnaires measuring competitive combat sport experiences, demographic details, Sportspersonship traits (compliance towards rules, respect for opponents, and game perspective), and competition anxiety (somatic, cognitive, and self-confidence; reported retrospectively). Results suggest that mentally tough athletes experience lower levels of cognitive and somatic

anxiety, and higher self-confidence, prior to competitions. Findings also found that athletes endorsing more altruistic and respectful attitudes in sport (Sportspersonship) reported higher levels of competition anxiety. The findings demonstrate that mental toughness is allied to positive attributes and could potentially be operationalized to improve both the retention and performance of combat sports athletes. Thus, the authors advocate the use of mental toughness coaching interventions within combat sports.

Mousavi, E., et al. (2023). "The Effect of a Modified Mindfulness-Based Stress Reduction (MBSR) Program on Symptoms of Stress and Depression and on Saliva Cortisol and Serum Creatine Kinase among Male Wrestlers." Healthcare (2227-9032) **11**(11): 1643.

Objectives: The aims of the present study were two-fold: to investigate whether, compared to an active control condition, a modified mindfulness-based stress reduction (MBSR) program could (1) reduce symptoms of stress and depression, and (2) regulate salivary cortisol and serum creatine kinase (CK) concentrations, two physiological stress markers. Methods: Thirty male wrestlers (Mage = 26.73 years) were randomly assigned either to the MBSR intervention or the active control condition. Both at the beginning and at the end of the intervention, the participants completed questionnaires on perceived stress and depression; in parallel, salivary samples were collected to measure cortisol in saliva, while blood samples were collected to assess serum CK. The study lasted for eight consecutive weeks. The intervention consisted of 16 group sessions (90 min each); the active control condition had an identical schedule, though without bona fide interventions. During the study period, the participants kept their sleeping, nutritional and exercising schedules unaltered. Results: Over time, symptoms of stress and depression decreased; the level of decrease was more prominent in the MBSR condition than the active control condition (significant p values and large effect sizes of interaction). Further, cortisol and creatine kinase concentrations also decreased more in the MBSR condition compared to the active control condition (large effect sizes of interaction). Conclusions: The present study's findings suggest that among male wrestlers, a modified MBSR intervention have the potential to reduce both psychological (stress and depression) and physiological (cortisol and creatine kinase) indices as compared to an active control condition.
Keywords**:** mental health; mindfulness-based stress reduction (MBSR); cortisol; athletes; creatine kinase

Mukhamedov, A. M., et al. (2023). "NONPARAMETRIC IDENTIFICATION OF WRESTLERS' EYE MOVEMENTS USING A DIFFERENTIAL NEURAL NETWORK." Russian Journal of Biomechanics **27**(2): 58-64.

Nowadays there are different multiple modern technologies that allow studying correlates of development of sportsmen's professional qualities. Eye tracking is one of such technologies, widely used in sport practice. The article demonstrates application of eye tracking to the task of testing wrestling athletes using a virtual environment demonstration in a HTC Vive Pro Eye headset. Built-in eye-tracking systems of VR headsets often suffer from a low sampling rates and possible pupil loss during recording. Filtering can be applied in order to combat these effects, for example Kalman and similar filters. In this case, an adequate mathematical model in the state space is required. Usually a parametric or nonparametric model of the system in question is created. If dynamics of the model is known, the problem is usually reduced to identification of system parameters. It is not always possible to give an adequate mathematical description of the processes occurring in the system, or the system itself can be represented as a "black box". The oculomotor system may also be described as one such system. In such cases, nonparametric identification is applicable, that is, identification of the dynamics of the system. This paper proposes to identify the dynamics of the system using differential neural networks. They have good approximating capabilities for non-linear systems. The standard sigmoidal activation function was replaced by the Izhikevich activation function described by differential equations. The result of the work of the neural network identifier was an approximate system describing the dynamics of the ocular movement. Computational modeling was carried out. The workability of the model is studied on several data sets obtained by recording the

oculomotor reaction of athletes-wrestlers to visual stimuli in a virtual environment, showing the effectiveness of the neural network learning laws

Mulhaire, R. (2023). "'THE WRESTLING RAGE'—THE WORLD CHAMPIONSHIP TOURNAMENT IN DUBLIN, 1907." History Ireland **31**(2): 30-33.

Between the close of the nineteenth century and the beginning of the First World War professional wrestling, in the words of Matthew Lindaman, 'enjoyed a status unparalleled among other sports of the time'. This stemmed from a rise in mass culture, nationalism and *fin de siècle* anxieties about masculinity and degeneracy. Ireland was no exception in this regard, though very little has been written about the history of professional wrestling in this country to date. Wrestling's popularity in the United Kingdom was buoyed by the arrival of George Hackenschmidt in early 1902. Born in Tartu, Estonia, in July 1877, Hackenschmidt, the most famous wrestler of his age, made his name by winning an amateur tournament in Vienna in 1898. Turning professional in 1900, he undertook a tour of the United Kingdom under the management of Charles Blake Cochran (1872– 1951). Huge crowds flocked to watch 'the Russian Lion' compete; as the *Manchester Evening News* noted in October 1902, Hackenschmidt succeeded in 'widening the scope of interest [in the sport] far beyond what old wrestlers are accustomed to'.

Nabilpour, M., et al. (2023). "An investigation into the associations between psychological skills, anaerobic fitness, and aerobic fitness in elite Iranian taekwondo athletes." PLOS ONE **18**(7): e0288227.

This study investigated the relationship between psychological skills and fitness levels among elite taekwondo athletes. A total of ten Iranian male elite taekwondo athletes (mean age of 20.6±2 years, BMI 18.78±0.62 kg/m2, and fat percentage of 8.87±1.46%) participated in the study. The Sports Emotional Intelligence Questionnaire, Sports Success Scale, Sport Mental Toughness Questionnaire, and Mindfulness Inventory for Sport were used to assess psychological factors. The Wingate test was used to determine anaerobic power, and the Bruce test to determine aerobic fitness. Descriptive statistics and Spearman rank correlation coefficients were utilised to examine any relationships between subscales. Statistically significant correlations were recorded between the evaluation of feelings (EI scale) and VO2peak (ml/kg/min) ($r = -0.70$, $p = 0.0235$) and between social skills (EI scale) and relative peak power (W/kg) ($r = 0.84$, $p = 0.0026$). Also, between optimism (EI scale) and VO2peak (ml/kg/min) ($r = -0.70$, $p = 0.0252$) and between optimism (EI scale) and HR-MAX ($r = -0.75$, $p = 0.0123$); and, finally, between control (mental toughness scale) and relative peak power (W/kg) ($r = 0.67$, $p = 0.0360$). These findings demonstrate relationships between psychological factors and the advantages of good anaerobic and aerobic capabilities. Finally, the study also demonstrated that elite taekwondo athletes have high mental performance abilities that are interrelated with anaerobic and aerobic performance.

Nagovitsyn, R. S., et al. (2023). "Artificial Intelligence Program for Predicting Wrestlers' Sports Performances." Sports (MDPI) **11**(10): 196.

To date, there are conflicting opinions about the effectiveness of the introduction of artificial intelligence technologies in sports. In this regard, the purpose of the study was to develop and integrate an intellectual program for predicting competitive success into the process of selecting wrestlers to increase its effectiveness. The authors developed a program for predicting the sports performance of wrestlers on the basis of artificial intelligence technology. To implement the study, the individual data of Greco-Roman wrestlers (n = 72) were collected and processed on 36 comparison traits, ranked into categories according to three key areas: sports space, hereditary data and individual achievements. As a result of data processing through means of deep neural

networks and machine learning algorithms, two prediction categories were identified: athletes who performed at the sport rank or the highest standard and athletes who did not achieve this standard. Control testing of the created program showed only 11% of error probability in predicting a given wrestler's competitive performance. As for the functionality of the program in the area of classification of the features by category, the authors' artificial intelligence program with 100% probability identified key categories of traits that reliably affect the results of the future sports performance of a young wrestler. Thus, the use of neural networks and machine learning algorithms, according to the results of the study, improves the quality of sports selection, which will allow further timely individualization and improvement of the training process of young wrestlers.

Nobari, H., et al. (2023). "Season jump performance and wellness variables in Turkish national youth wrestlers." Human Movement **24**(3): 54-63.

Purpose. The aim of this study was 2-fold: (1) to analyse the variations of countermovement jump (CMJ) performance over the different periods of the season (early-, mid-, and end-season) and (2) to analyse the correlations between CMJ performance and wellness variables over season periods. Methods. Overall, 10 elite young male freestyle wrestlers (aged 16.0 ± 0.7 years) participated in this study during the 32 weeks of the season. Neuromuscular performance was analysed via a CMJ protocol and well-being variables were monitored by using the Hooper index questionnaire. Repeated measures analysis of variance with eventual Bonferroni post-hoc test was applied to investigate the differences between season periods within weeks. Results. There were no significant changes of neuromuscular performance throughout the season, which suggests the absence of neuromuscular fatigue. No relationships were found between CMJ performance and any single well-being variable. In turn, a small association was observed between weekly Hooper index and neuromuscular status early in the season (correlation coefficient: 0.20, $p = 0.044$). Conclusions. Using the sum of all well-being variables instead of the single variables may be better to track possible neuromuscular status variations in wrestling athletes, particularly early in the season.

Ojeda-Aravena, A., et al. (2023). "A Systematic Review with Meta-Analysis on the Effects of Plyometric-Jump Training on the Physical Fitness of Combat Sport Athletes." Sports (2075-4663) **11**(2): 33.

We aimed to assess the athletic performance changes in combat sport athletes (CoSAs) after plyometric-jump training (PJT), compared to control conditions, through a systematic review with meta-analysis. Following PRISMA guidelines, three electronic databases were searched for includable articles, according to a PICOS approach. Using a random-effects model, Hedges' g effects sizes (ES) were calculated. Heterogeneity was assessed using the I2 statistic, with values of <25%, 25–75%, and >75% representing low, moderate, and high levels of heterogeneity, respectively. Statistical significance was set at $p \leq 0.05$. The certainty of evidence was assessed using the GRADE approach. Twelve eligible articles were identified for systematic review, seven of high quality and five of moderate quality, according to the PEDro scale. The studies recruited taekwondo, silat, wrestling, judo, fencing, and karate athletes (292 total participants), including specific–active and active controls. Most participants had a mean age of <18 years and were males (n = 225). Compared to the control, PJT programmes, involving 4–12 weeks and 2–3 sessions per week, induced small to moderate improvements (ES = 0.47 to 1.04) in athletes' maximal strength (e.g., 1RM squat), vertical jump height, change-of-direction speed, and specific performance (e.g., fencing movement velocity), although without meaningful effects on body mass, fat mass, and muscle mass (ES = 0.02 to −0.06). Most (7 of 8) outcomes attained low heterogeneity. The outcome-level GRADE analysis indicated a certainty of evidence from low to moderate. In conclusion, PJT, when compared to control conditions, may improve CoSA athletic performance.

Özer, U. (2023). "Olympic Philately: Reading the 1896 Athens Olympics from Postage Stamps." International Journal of the History of Sport **40**(1): 18-40.

A postage stamp is principally used to demonstrate that postage has been paid. However, governments also use postage stamps to convey various messages to the world, and the message the stamp contains reaches many people. Therefore, postage stamps are frequently used to embrace and disseminate an idea or belief, to convey information to a target audience, or to announce or promote an event. Additionally, philately (or stamp collecting) remains a popular hobby. Stamp collectors, who consider stamps as works of art, meticulously collect, classify, and scrutinize the details linked to stamps. Philately also has deep ties to the Olympic games. Olympic postage stamps, which were first introduced to offer financial assistance in organizing the 1896 Athens Olympics, have also served the purpose of promoting the Olympics at the international level. Furthermore, the works of ancient Greek culture and art were admirably depicted on the first Olympic postage stamps. These stamps, which also contribute to the revival of the Olympics, have rich symbolic meanings behind their visuals.

Pałka, T., et al. (2023). "Concentration levels of selected hormones in judokas and the extent of their changes during a special performance test at different ambient temperatures." BMC Sports Science, Medicine & Rehabilitation **15**(1): 1-12.

Background: There is little scientific literature available on the diversity of physiological responses of judokas to anaerobic interval exercises in warm environments. Understanding the dynamics of changes in the concentration of selected hormones during a special endurance test at different ambient temperatures may have significant practical value, as it provides an opportunity for optimal programming and monitoring of the training process. So, the main aim of the research was to survey interval anaerobic exercises in different ambient temperatures on Concentration levels of selected hormones in judokas. Methods: 15 judokas athletes (age: 20.65 ± 2.03 years; body height: 178.00 ± 6.31 cm; body mass: 76.26 ± 12.57 kg; training experience: 12.1 ± 1.57 years) volunteered for the study. The judokas performed five sequences (each lasting 7.20 min) of pulsatile exercises on a cycle ergometer and hand ergometer in a thermoclimatic chamber at temperatures of 21 ± 0.5 °C and 31 ± 0.5 °C. The exercises were different from typical interval exercises, with varying times, upper and lower limb loads, and were followed by a 15-minute break after each sequence. Total duration of the experiment, including the five sequences of pulsating exercise and four 15-minute rest breaks between each exercise sequence, amounted to 96 min and 20 s. The workload was increased by 20 W for the lower limb tests and 12 W for the upper limb tests every 2 min. Biochemical measurements of testosterone (T), cortisol (C), growth hormone (HGH), adrenocorticotropic hormone (ACTH), follicle-stimulating hormone (FSH), adrenaline (E), noradrenaline (NE), and β-endorphin (β-end)were performed using the enzyme-linked immunosorbent assay (ELISA) method on blood samples taken before and after five series of pulsatile exercises, at 1, 24, and 48 h. Results: Pulsatile exercise at ambient temperatures of 21 and 31 °C resulted in a decrease in body weight of the studied athletes ($p < 0.05$) and significantly reduced body volume and plasma volume after training ($p < 0.05$). The concentration of HGH, testosterone, cortisol and NE showed a statistically significant difference after the end of the series of pulsating exercises at both temperatures ($p < 0.05$) and did not significantly affect the concentration of ACTH, FSH and adrenaline concentration. Conclusions: An increase in the concentration of growth hormone, cortisol and NE was observed after doing the work at both 21 and 31 °C ambient temperature. Physical exertion in both ambient temperatures contributed to a statistically significant decrease in testosterone concentration. Based on the obtained research results, it can be concluded that physical activity in various thermal conditions of the external environment activates the hormonal response to varying degrees, with the direction of changes depending on the external thermal factor.

Panchenko, I. A., et al. (2023). "GENDER DIFFERENCES OF MORPHOFUNCTIONAL SIGNS IN PERSONS ENGAGED IN SINGLE COMBATS." Teoriya i Praktika Fizicheskoy Kultury **2023**(3): 93-95.

Objective of the study was to compare the degree of expression of sexual dimorphism of morphofunctional traits in athletes involved in taekwondo and martial arts in general. 101 athletes and 105 athletes aged 18-23 years old, specializing in martial arts (taekwondo, boxing, freestyle wrestling), performing in the qualification of the I adult category-Master of Sports were examined. All representatives of martial arts were combined into two groups of a single array (sportsmen and athletes). Taekwondo athletes made up two experimental groups (sportsmen and sportswomen). Methods and structure of the study. With the help of anthropometry, all the necessary measurements were made in athletes (longitudinal, transverse, girth, thickness of skin-fat folds), body mass components and somatotype according to the Heath-Carter scheme were determined, indicators of VC, backbone strength and dynamometry of the leading arm were identified. Results and conclusions. Differences in the sexual dimorphism of morphological and functional parameters in taekwondo fighters were revealed in comparison with a single array of martial artists. Gender differences in functional indicators in the examined athletes are more pronounced than in morphological parameters, regardless of the type of martial arts.

Rueda Flores, M., et al. (2023). "Training Conditions and Psychological Health: Eating Behavior Disorders in Spanish High-Performance Women's Olympic Wrestling Athletes-A Qualitative Study." International journal of environmental research and public health **20**(3).

(1) Background: the aim of this study was to determine the factors that affect the occurrence of behaviors related to possible eating disorders in Spanish high-performance Olympic wrestling athletes. (2) Methods: The sample consisted of 22 elite female wrestlers selected through purposive sampling with inclusion criteria of (i) having been a national champion, (ii) having been part of the Spanish team, and (iii) suffering or having suffered from an eating disorder. The semistructured interviews were conducted online and lasted between 20 and 40 min. A statistical analysis was performed with NVivo10 software. (3) Results: the athletes showed a series of issues grouped into three main themes, which were divided into the following categories-firstly, the reasons why wrestlers lose weight; secondly, the inadequate procedures they use; and, finally, the reference persons involved in the process. (4) Conclusions: The training conditions in high-performance sports have psychological and behavioral effects on wrestlers. Wrestlers have to move down to lower categories; however, they do not take into account how this practice influences their health when using inadequate procedures. Rapid and significant weight loss produces negative effects, especially in the female population, generating an incidence of eating disorders. The information obtained provided elements of interest for reflection on possible solutions to prevent existing eating disorders.

Sabillah, M. I., et al. (2023). "THE EFFECT OF THE PYRAMID EXERCISE METHOD ON THE MAXIMUM STRENGTH OF THE WRESTLER'S ARM MUSCLES." Physical Education Theory and Methodology **23**(4): 512-519.

Study purpose. The purpose of this study was to determine the effect of reverse grip barbell curls and barbell triceps extension exercises on increasing the maximum strength of the arm muscles of wrestling athletes. Materials and methods. This type of research is quasi-experimental. The population in the study was 24 wrestling athletes. Sampling was carried out using purposive sampling techniques, namely 10 male wrestling athletes. The research instrument was carried out by lifting a load that was only able to be lifted 1 time or

expressed ability (maximum strength) using a barbell. The data analysis technique used is hypothesis testing using the t-test formula. Results. The results of this study showed that the exercises of reverse grip barbell curls and barbell triceps extension have an effect on the increase in the maximum strength of the arm muscles of wrestling athletes; from the initial test and the final test results, there was an increase with a difference of 1.04, namely from an average score of 29.9 kg in the pre-test to 32.3 kg in the post-test. Conclusions. The conclusion in this study is that there is a significant influence of the reverse grip form of barbell curls and barbell triceps extension on the increase in maximum strength of the arm muscles in wrestling athletes.

Sarikaya, M., et al. (2023). "Investigation of Weight Loss Methods of Wrestlers Fighting in Different Styles and Categories During the Competition Period." Turkish Journal of Sport & Exercise / Türk Spor ve Egzersiz Dergisi **25**(1): 35-41.

This research was conducted in order to determine the preferred weight loss methods of wrestlers in the category of juniors, cadets and espoir who compete in Greco-Roman and freestyle wrestling. 215 male wrestlers between the ages of 14 and 17 participated in the study. In order to determine the weight loss methods of wrestlers, the "athlete weight loss methods and effects scale" developed by Yarar et al. (2016) and the personal information form developed by the researchers were used. In the analysis of the data obtained from the wrestlers SPSS package program was used. Independent t test was used from binary comparisons and ANOVA test was used for multiple comparisons. Significance level was accepted as $p<0.05$. According to the styles variable, it was found that there was a significant difference between free and Greco-Roman wrestlers in the diet sub-dimension of the athlete weight loss and effects scale ($p<0.05$). According to the category variable, it was determined that there was a significant difference in the diet and ergogenic aids sub-dimensions of the juniors and the espoir ($p<0.05$). As a result, it is observed in the research findings that wrestlers usually use the diet method as a method of weight loss. It is thought that one of the most appropriate methods to protect the health and athletic performance of athletes is to apply a conscious diet, which will be more advantageous than other methods. In addition, it can be said that wrestlers consciously and healthily apply weight loss methods as they get older

Silva, G. C., et al. (2023). "Influence of different recovery intervals on time under tension, total training volume, and fatigue index in horizontal bench press exercise in young male wrestling athletes." The Journal of Sports Medicine and Physical Fitness **63**(10): 1027-1034.

BACKGROUND: The recovery interval (RI) seems to be a variable closely related to the training volume since it can determine the performance after this rest time. This study investigated the influence of different recovery intervals on time under tension (TUT), total training volume (TTV), and Fatigue Index (FI) in the horizontal bench press exercise. METHODS: Eighteen male wrestling athletes underwent three visits: 1st) performed the 10-repetition maximum (10RM) test; 2nd and 3rd) performed 5 sets of up to 10 repetitions with 1 minute (RI1) and 3 minutes (RI3) of passive RI with randomized entry. TUT, number of repetitions, TTV and FI data were collected or calculated. RESULTS: TUT was lower in sets 5 ($P<0.001$) for RI1 when compared to RI3, with no significant difference for the other 4 sets. The number of repetitions for RI1 was lower when compared to RI3 in sets 3 ($P=0.018$), 4 ($P=0.023$), and 5 ($P<0.001$), with no significant difference in sets 1 and 2. The FI was significantly higher for RI1 ($P<0.001$); however, TTV was significantly higher for RI3 ($P=0.007$). CONCLUSIONS: Different RI influenced the TUT and the number of repetitions along 5 sets in the horizontal bench press exercise. Moreover, these two variables showed different behavior when compared under the same condition (RI1 or RI3),

especially after the third set. Using longer RI demonstrated a greater ability to maintain TTV and less negative effect of fatigue in young male wrestling athletes.

Skugor, K., et al. (2023). "Motivation Profile of Youth Greco-Roman Wrestlers; Differences According to Performance Quality." Sports (2075-4663) **11**(2): 43.

Athletes have to possess high motivation levels to perform each training session and competition at the highest level. Thus, the motivation of the wrestler is essential to reach the highest performance quality. The research included 47 Greco-Roman wrestlers aged 17.71 ± 1.62 years. Variables included anthropometric indices, sports motivation assessed by the revised Sport Motivation Scale (SMS-II), and competitive success (medal winners and non-winners at the National Championship). The Cronbach's alpha coefficients checked the internal consistency of the SMS-II. Differences between performance quality were determined by Cohen's d effect sizes, and MANOVA for motivation and anthropometric variables/body build variables. In the total sample, wrestlers had high levels of intrinsic motivation (5.97 ± 0.90), integrated (5.99 ± 0.83), and identified (6.08 ± 0.82) regulation, while they had low amotivation (2.53 ± 0.98) and external regulation (3.26 ± 1.24). Successful wrestlers had significantly higher intrinsic motivation than less successful wrestlers (Cohen's d = 0.76, moderate effect size). Results evidenced that wrestlers have high self-determined motivation, which is vital for maximal performance and persisting in sports. Future research should investigate wrestlers from other age groups to ultimately determine the sport motivation profile of wrestlers and enable their optimal sports development.

Skugor, K., et al. (2023). "Generic and Specific Fitness Profile of Elite Youth Greco-Roman Wrestlers; Differences According to Quality and Weight Category." Sport Mont **21**(1): 23-30.

This study aimed to investigate the validity of the Specific Wrestling Fitness Test (SWFT), correlating it with generic anaerobic tests in elite youth wrestlers and determining whether wrestlers differ according to quality and weight categories in all tests. The research included 23 advanced-level Greco-Roman wrestlers (aged 16-19 years) who were divided into two quality categories (National team members and Non-team members) and two weight categories (lighter and heavier). Variables included anthropometric characteristics, generic fitness tests, and SWFT. Results evidenced that only vertical jump height was associated with SWFT (Pearson's $R=0.48$, $p<0.05$). Team members had higher results in the vertical jump height ($p=0.02$, moderate ES), while wrestlers from the heavier category had higher body mass ($p=0.001$, large ES) and body height ($p=0.01$, large ES) than lighter wrestlers. Moreover, wrestlers did not differ in the SWFT according to quality and weight categories. SWFT was not associated with generic fitness tests, possibly because of its high specificity. Furthermore, team members and non-team members did not differ in the SWFT, which could be explained by the fact that only advanced-level wrestlers were included in this study. Thus, future studies should include lower-quality wrestlers and different testing protocols.

Smolianov, P. (2023). "COMPARING PRACTICES OF WRESTLING IN THE USA AGAINST A GLOBAL MODEL FOR INTEGRATED DEVELOPMENT OF MASS AND HIGH PERFORMANCE SPORT." INTERNATIONAL JOURNAL OF WRESTLING SCIENCE **13**(2): 9-13.

Referencing domestic and global practices, this study provides information on what might be implemented as best practices to advance the sport of wrestling in the USA. The authors utilized the model of integrated elite and mass sport development from past research, which formed the foundation for a questionnaire and interview schedule for US wrestling coaches and administrators to generate a snapshot of

perceptions of the current sport system and possibilities for its further development. Survey questions based on more than 200 published sources were validated by six experts including academicians, executives from sport governing bodies, coaches and administrators. To determine the areas for improvement, the questionnaires were completed by 102 coaches. Possible advancements were further identified through semi-structured discussions with 10 wrestling administrators and experts. Results suggest possible enhancements at micro-, meso- and macro-levels of the proposed model for better international performance as well as greater national sport participation.

Strosser, S. (2023). "Youth Sport Specialization and Risk of Injury: A General Review." Clinical Journal of Sport Medicine **33**(6): 652-657.

Objective: The purpose of this literature review was to analyze, understand, and disclose prior empirical findings about the injury risks associated with youth sport specialization. Data Sources: Articles were included in this review if they examined the association between youth sport specialization status and injury. Nine articles from 5 journals met these criteria. All articles summarized the findings of cross-sectional (N 5 5) or cohort studies (N 5 4). Main Results: Each article included in this review indicated that specialized youth athletes are more susceptible to injury. Only 5 studies assessed the injury risks linked to specialization independent of sport training volume. These studies produced contradictory results. Conclusions: Although specialized youth athletes are more prone to injury, future research is needed to determine the independent and inherent injury risk associated with specialization. Nevertheless, youth athletes should refrain from specialization until at least adolescence.
Key Words: youth sport specialization, injury, overuse injury, youth athlete, training volume, youth sports

Tarabrina, N. Y. (2023). "Features of the Brain Electrical Activity of Athletes-Fighters in Comparison with Non-athletes." International Journal of Human Movement and Sports Sciences **11**(4): 902-907.

The study of the neural mechanisms underlying sports performance was aimed at studying the characteristics of the brain electrical activity of athletes-fighters in comparison with non-athletes. Thirty young men of 19.97±0.23 years old (with the height of 179.82±2.15 cm and the body weight of 78.61±1.68 kg) engaged in wrestling (with the qualification “Master of Sports”), and thirty young men of 19.25±0.18 years old (with the height of 178.35±2.25 cm and the body weight of 77.93±1.45 kg), not involved in sports, analyzed the frequency ranges delta, theta, alpha, beta 1 and beta 2 rhythms of electroencephalography (EEG) at rest in three epochs: the first epoch with closed eyes, the second epoch with open eyes, and the third epoch with closed eyes. The results of the study showed that in wrestlers, the neural advantage over non-athletes is expressed only in a decrease in alpha rhythm fluctuations: with closed eyes in the left hemisphere by 17.07% ($p<0.05$), and in the right hemisphere by 17.35($p<0.05$). With open eyes, the difference was 21.17% ($p<0.01$) in the left hemisphere and 19.27% ($p<0.05$) in the right hemisphere, which indicates a lower cortical activity of the brain of athletes. At the same time, the coefficient of reactivity (CR) of the alpha rhythm during the receipt of visual information in athletes in the left hemisphere is 20% higher, and when it is interrupted, it is 18% lower than in non-athletes. In the right hemisphere, CR does not differ. We concluded that wrestlers recruited fewer neural resources without compromising performance, supporting the hypothesis of neuronal flexibility in the brains of athletes compared to non-athletes.

Tortu, E., et al. (2023). "Evaluation of Different Equations for Resting Metabolic Rate Prediction in Female Combat Sports Athletes." Montenegrin Journal of Sports Science & Medicine **12**(2): 41-48.

Only a few studies have produced equations that can estimate resting metabolic rate (RMR) in female athletes, but the accuracy of these equations for combat athletes has not yet been tested. The aim of this study was to evaluate the 12 different equations which are commonly using to determine resting metabolite rate (RMR) in the literature. Twenty-three female combat sport athletes (24.23± 3.39 years; 166.8 ± 5.3 cm; 63.13±6.53 kg; 8.78±3.19 experience years.; 56.40±3.43 VO2 mL/kg/min) were participated this study in voluntarily basis. A cross-validation approach used to compare the accuracy of 12 commonly prediction equations with measured RMR by indirect calorimetry to determine RMR in female combat sports athletes. All the predictive equation was underestimated RMR when compared with the measured RMR ($p < 0.05$) and the smallest mean difference (92.46 ± 210.38 kcal·d-1) was observed for Altman & Dittmer equation amongst the 12 predictive equations. The Altman & Dittmer equation was accurately predicted 16 out of 30 subjects' RMR value within the range ±10%. However, based on the Bland-Altman plots, the prediction equations were not accurately nor precisely predicted RMR in the current sample of female combat sport athletes. The results in the present study showed that the Altman & Dittmer equation is most suitable equation to predict RMR amongst 12 equations. Although the Altman & Dittmer equation was resulted with smallest mean difference, it seems that there is need to further research with longitudinal approach to understand the effects of training intensity and body mass changes on RMR in order to develop the formulas already exist used commonly.

Tripp, M. (2023). "Cornish wrestling in the nineteenth century." Sport in History **43**(2): 137-165.

During the first half of the nineteenth century the Cornish economy was thriving, dominated by the metal mining industry. When the economy was thriving, Cornish wrestling was at the height of its popularity when a large number of wrestlers entered numerous tournaments for lucrative prizes and witnessed by large crowds. It was also the time when the sport flourished in London. The leading wrestler during this period was Tom Gundry, who in a relatively short career won many of the tournaments in Cornwall, Devon and London and consequently was able to amass a significant sum in prize money. Despite his prominence he occasionally resorted to match-fixing or 'faggoting' with his opponents. During the second half of the nineteenth century, however, there was a collapse of the economy which had a deleterious effect upon Cornish wrestling with decreases in numbers of wrestlers, tournaments, prize money and spectators. The sport also disappeared from London. The common thread running throughout the nineteenth century is a 'persistence of difference'. Cornwall's historical experience was different from the rest of Britain and that difference has persisted over time and has led to a unique identity. Cornish wrestling contributed to the construction of that identity

Trivic, T., et al. (2023). "Rapid weight loss can increase the risk of acute kidney injury in wrestlers." BMJ Open Sport & Exercise Medicine **9**(2): e001617.

Objective Restrictive diets, forced starvation or voluntary weight loss are attracting more and more attention from scientists. Overall trends show that about 80% of combat sports athletes use specific methods of reducing body mass. Rapid weight loss could be a risk factor for kidney-related adverse outcomes. This study aimed to examine the impact of high-intensity specific training combined with rapid weight loss in the first and without rapid weight loss in the second phases on body composition and biochemical markers of kidney function. **Methods** The study was conducted on 12 male wrestlers. Kidney function markers were measured, including blood urea nitrogen, serum creatinine, uric acid and serum Cystatin-C. Alterations in analysed markers were noted in both phases of the research. **Results** According to the data, a significant increase was noted in blood urea nitrogen ($p=0.002$), uric acid ($p=0.000$) and serum creatinine ($p=0.006$) during the first phase in comparison with the second phase. The levels of serum Cystatin-C were slightly elevated after both phases

compared with the initial measurement. Conclusion It is evident that high-intensity specific training combined with rapid weight loss significantly affects the increase in kidney function markers compared with identical training without rapid weight loss. The findings in this study suggest that rapid body mass reduction is associated with an increased risk of acute kidney injury in wrestlers. Data are available on reasonable request. The datasets generated during and analysed during the current study are available from the corresponding author on reasonable request.

Tropin, Y., et al. (2023). "Special physical training of qualified wrestlers of individual styles of wrestling." Slobozhanskyi Herald of Science and Sport **27**(2): 56-63.

Background and Study Aim: Special physical preparedness of wrestlers is one of the main factors for achieving the highest possible results in competitive activity. Physical qualities can differ significantly among wrestlers of the same skill level, but different individual styles. In this regard, this study is aimed at improving the methods of special physical training of qualified wrestlers, taking into account individual styles of wrestling. Material and Methods: The study involved 30 wrestlers of middle weight categories (72 kg, 77 kg, 82 kg). The participants were divided into two groups: control group-15 athletes, average age (18.96±1.09) years, average weight (76.27±5.58) kg; experimental group-15 people, average age (19.07±0.95) years, average weight (75.87±5.68) kg. All participants belonged to athletes of a high level of skill. Training tasks were developed to improve the methodology of special physical training of wrestlers, taking into account the styles of wrestling. The proposed program was tested in a pedagogical experiment that lasted one year. Significance of differences between groups was as-sessed using nonparametric signs (z) and Rosenbaum (Q) tests. Results: during the experiment, the increase in the results of special physical preparedness among the wrestlers of the experimental group is much higher in all tests and it is in the range from 6% to 14%, and in the control group it is lower-from 2% to 3%. Also, these results were confirmed by a non-parametric criterion of signs. So, the wrestlers of the experimental group at the end of the experiment showed an improvement in performance. A significant increase in the results in the «Pull up» test was shown ($z=1$; $p<0.01$). The time to complete the tests significantly decreased: «10 back arch throws» ($z=0$; $p<0.01$), «10 suplexes» ($z=0$; $p<0.01$), «Flips on the gymnastic “bridge”» ($z=0$; $p<0.01$), «Running on the wrestling “Bridge”» ($z=0$; $p<0.01$), «10 forward somersaults» ($z=0$; $p<0.01$), «Three series of 15 back arch throws» ($z=3$; $p<0.05$). The number of repetitions in the tests increased: «Pull-up in 20 s» ($z=4$; $p>0.05$), «Push-up in 20 s» ($z=4$; $p>0.05$). Conclusions: The fulfillment of the developed training tasks by the wrestlers of the experimental group made it possible at the end of the experiment to show significantly better results in terms of special physical fitness than the athletes of the control group ($p<0.05$-0.01). Such results testify to the effectiveness of the proposed methodology and the possibility of its implementation in the training process.

Turkmen, M. and A. Arslan (2023). An ancient sport in central Asian Turkic peoples: Oogdarish/enish (wrestling on Horseback). Applications of Traditional Equestrian Sports in the World**:** 31-46.

In this study, "wrestling on horseback" which is a traditional sport called "enish" or 'Oodarish/Avdarys/Audarysh' done in the Middle East Region (Turkestan) will be mentioned and introduced. Purpose: Having kept the two socio-cultural values known as horse riding and wrestling for centuries, wrestling on horseback (oogdarish) formed with the combination of these two sports is more than a sportive activity. The purpose of the study is to know and introduce this ancient traditional sport separated into two groups 'Men's-enish' and 'women's enish" and bring it to the world sports literature.

Ünver, G. and H. Eroglu (2023). "EVALUATION OF Q ANGLE, LOWER EXTREMITY FLEXIBILITY AND MUSCLE SHORTNESS IN WRESTLERS." TURKISH JOURNAL OF PHYSIOTHERAPY REHABILITATION-TURK FIZYOTERAPI VE REHABILITASYON DERGISI **34**(2): 227-234.

Ünver, G. and H. Kocaman (2023). "Determination of Functional Movement Screening Scores in Wrestlers and Examination in terms of Some Variables." Muscles, Ligaments & Tendons Journal (MLTJ) **13**(1): 103-108.

Objective. The aim of this study was to determine functional movement screening (FMS) scores in wrestlers to examine FMS scores in terms of years of sport experience and wrestling weight, and to determine the relationship between FMS score and body mass index (BMI). Materials and methods. Forty-four male wrestlers were included in this study. Functional movement analyses were performed of the wrestlers. In addition, the wrestlers filled out a personal information form which contains information such as age, years of sport experience, wrestling weight, and height. Results. The FMS scores of the wrestlers have been found to be 16.07 ± 1.87. A statistically significant difference has been found in terms of FMS scores according to years of sport experience and wrestling weight ($p < 0.05$). A statistically significant correlation has been found between the FMS score with BMI ($p < 0.05$). Conclusions. It has been concluded that the FMS scores of the wrestlers with more years of sport experience are higher, the FMS scores of the wrestlers with low body weight are lower, and the FMS score increases as the BMI increases. It is thought that the functional movement levels of the wrestlers should be evaluated regularly at certain intervals and interpreted according to their characteristics.

Uzer, O., et al. (2023). "The posture of high-level wrestlers affects their functional movement patterns: An observational study." Science and Sports **38**(2): 209.e201-209.e211-209.e211.

Objectives. — Although there are reports in the recent literature demonstrating the epidemiology of injuries in the wrestler population, no study could be found which has investigated the effect of posture on the functional movement patterns in wrestlers. This study was planned to investigate the effect of posture on the Functional Movement Screen (FMS) scores in wrestlers. *Equipment and methods.* — The study included 68 male (30 greco-roman and 38 freestyle) wrestlers. Spine posture and flexibility were measured via Spinal Mouse (SM). The New York Posture Rating (NYPR) and FMS Test Kits were used to evaluate overall body posture and functional movement patterns, respectively. *Results.* — Significant weak correlations were found between the FMS sub-parameters, SM sub-parameters and NYPR total score (= −0.265—0.297; $P < 0.05$). There was a significant weak to moderate relationship between FMS and SM spine-check sub-parameters (= −0.262—0.372; $P < 0.05$). A significant weak to moderate correlation was found between NYPR sub-parameters for abdominal, chest, foot, shoulder and head postures and all FMS sub-parameters excluding rotation stability (= 0.329—0.504; $P < 0.05$). There was no relationship between FMS, SM and NYPR total scores.

Vasilescu, F., et al. (2023). "Optimising the Competitive Performance of Junior Greco-Roman Wrestlers by Consolidating and Improving Their Takedown Techniques." Romanian Journal for Multidimensional Education / Revista Românească pentru Educaţie Multidimensională **15**(4): 324-388.

In elite wrestling, achieving the best results in major competitions is the primary goal of all activities, and the secondary goal is to provide a recreational, compensatory, or therapeutic approach. In this regard, one of the current concerns in establishing the competition system focuses on children's competitions. For this reason, specialists in this field are turning their attention to getting as many children as possible involved in sports competitions. They will later represent the base of the secondary selection that will deliver juniors aspiring to

important titles. This paper aims to improve the takedown technique's performance in the training process through effective means developed after video analysis of the elemental mechanisms that constitute the action studied. The research was carried out between 19 February and 9 September 2022 within the Greco-Roman Wrestling Section of the School Sports Club no. 5 in Bucharest. The participants were advanced junior athletes aged between 15 and 17 years, competing in the Individual National Greco-Roman Championships. For the study scope, they were divided into two groups (a control group of 9 athletes and an experimental group of 9 athletes). Although both groups obtained similar results in the initial test, the experimental group achieved clearly better results in the final test compared to the control group, which demonstrates the difference between the types of training performed by the two groups.

Xizhang, H. and B. Gao (2023). "Constructing a Diagnosis Model and Visualizing the Risk Relationship between Biomarkers and Overuse Injuries in Well-trained Wrestlers." International Journal of Sports Medicine **44**(9): 642-649.

This study aimed to investigate the association between biomarkers and overuse injuries in well-trained wrestlers. Seventy-six well-trained wrestlers on a national team completed two blood sample collections, two clinical overuse injuries diagnoses, and a questionnaire survey at a 2-week interval. Multivariate logistic regression analysis and receiver operating characteristic curve were used to screen for related factors and construct the prediction probability model of overuse injuries. Using a restricted cubic spline further clarifies the relationship between biomarker levels and the risk of overuse injuries. Creatine kinase (CK), cortisol, rheumatoid factor, testosterone in men, and C-reactive protein (CRP) levels in the overuse injuries group were significantly different compared to those in the non-overuse injuries group. The diagnostic efficiency of the prediction probability model was more valuable than any single variable (area under the curve=0.96, Specificity=0.91, Sensitivity=0.89, high accuracy). A J-shaped relationship was noted between biomarkers (cortisol, CRP, and CK) and the risk of overuse injuries (cutoff point: 17.95 μg·dL-1 , 4.72 mg·L-1 , and 344 U·L-1 ; p for nonlinearity:<0.001, 0.025, and 0.043, respectively). In conclusion, a predictive model based on biomarkers (cortisol, CRP, and CK) predicted the overuse injuries risk of well-trained wrestlers. High levels of these three biomarkers were associated with a higher risk of overuse injuries, and a J-shaped relationship was observed between them.

Yildirim, Y., et al. (2023). "The effects of dynamic and static stretching exercises performed to elite wrestlers after high intensity exercise on heart rate variability." SCIENCE & SPORTS **38**(1): 2-11.

Yıldız, M., et al. (2023). "Relationship Between Training Load, Neuromuscular Fatigue, and Daily Well-Being in Elite Young Wrestlers." Research quarterly for exercise and sport: 1-10.

Purpose: This study investigated acute workload (wAW), chronic workload (wCW), acute: chronic workload ratio (wACWR), training monotony (wTM), perceived load training strain indicators (wTS), and countermovement jump (CMJ) as indicators of wellness in one season and defined weekly variations. In addition, we analyzed the relationships between training load measurements and weekly reports. Methods: 16 elite young wrestlers were monitored daily with individual observations for 46 consecutive weeks throughout the season. Training load was obtained using the session rating of perceived effort. wSleep, wStress, wFatigue & wMuscle Soreness well-being were monitored daily using the Hooper index. Results: As a result of the analysis, it was found that there is a moderate relationship (r = 0.51, p = .003) between ACWR and w mean load (A.U.) and a

high relationship (r = 0.81, p < .001) between monotony and strain. Conclusion: All variables other than ACWR, w mean load, strain, and monotony presented small and statistically insignificant relationships. These results provide coaches and practitioners with new insights into perceived loads and health changes during a season at the elite youth level.

Yuan, L. H., et al. (2023). "A Deep Learning Algorithm for Fusing Action Recognition and Psychological Characteristics of Wrestlers." KSII TRANSACTIONS ON INTERNET AND INFORMATION SYSTEMS **17**(3): 754-774.

Wrestling is one of the popular events for modern sports. It is difficult to quantitatively describe a wrestling game between athletes. And deep learning can help wrestling training by human recognition techniques. Based on the characteristics of latest wrestling competition rules and human recognition technologies, a set of wrestling competition video analysis and retrieval system is proposed. This system uses a combination of literature method, observation method, interview method and mathematical statistics to conduct statistics, analysis, research and discussion on the application of technology. Combined the system application in targeted movement technology. A deep learning-based facial recognition psychological feature analysis method for the training and competition of classical wrestling after the implementation of the new rules is proposed. The experimental results of this paper showed that the proportion of natural emotions of male and female wrestlers was about 50%, indicating that the wrestler's mentality was relatively stable before the intense physical confrontation, and the test of the system also proved the stability of the system.

Keywords: Deep Learning, Wrestling action, Action Recognition, Psychological Feature Analysis, Neural Network

Zadorozhna, O. (2023). "Practical experience of young athletes' tactical training in modern Olympic combat sports." Scientific discourse in physical education and sports **1**: 27-35.

The present work studied specifics of tactical training as an important side of training process in modern Olympic combat sports. In most scientific papers and official documents, the views on tactical training are contradictory and do not reflect all current trends of the development of Olympic combat sports. The aim of the research was to analyze practical experience of athletes` tactical training in modern Olympic combat sports at the stage of previous basic development. Material and Methods. We recruited 40 experts in Olympic fencing, boxing, wrestling, judo, taekwondo and karate. They were asked to fill out a form (questionnaire), which included 15 questions on athletes` tactical training such as directions, means and methods, control of tactical preparedness, components of tactical knowledge. In order to confirm the accuracy of the answers, the concordance coefficient (W) was determined in each group of experts. To compare the answers in different expert groups we also used the average rank. Results. It was found that a lot of issues of tactical training were estimated as the most significant in most combat sports. The same was typical for he least significant issues. The agreement of experts' opinions in different sports within one question was average, strong, weak ($p<0.05$) or unreliable ($p>0.05$). In some questions expert`s answers were similar, but in other questions they were different inside groups and between them. Average ($0.69W=0.5$, $p<0.05$) and strong concordance ($W=0.7$, $p<0.05$) was found in such groups of experts: fencing - about visual methods of tactical training; wrestling - about visual and practical methods; boxing - about directions and verbal methods; judo - o nly about visual methods; taekwondo - i n all questions except verbal methods; karate - in all questions. Conclusions. It is recommended to use the common algorithm for improving athletes` tactical preparedness with the possibility of its modification in particular kinds of Olympic combat sports. This algorithm consists of six steps and is aimed to study the basic elements, techniques, options of tactical actions which are essential for modern Olympic combat sports.

Zakharchenko, D. D., et al. (2023). "Development of special endurance in young freestyle wrestling." Bulletin of Izvestiya Tula State University. Physical culture. Sport **4**: 61-70.

A technique for increasing the special endurance of freestyle wrestlers aged 14-15 has been developed. Selected exercises for the development of special endurance on the grounds of interaction with other physical qualities. The educational and training load of classes in the weekly microcycle of the general preparatory period in the experimental group was distributed. The results of pedagogical testing of the control and experimental groups during the pedagogical experiment are presented.

Žugaj, N., et al. (2023). "Differences in Motor, Functional, and Sport-Specific Skills in Gifted Wrestlers with Different Acceleration of Biological Development." Sport Mont **21**(1): 117-121.

It is assumed that the selection of gifted children aged 13-14 years old is dominated by those with accelerated biological development. A better understanding of this problem can greatly improve the selection process for gifted children. The paper aimed to determine the differences in motor, functional, and sport-specific skills between children with different levels of biological acceleration. The study was conducted on a sample of 26 wrestlers aged 13.8±0.74 years old selected from the city of Zagreb. The participants were divided into three groups according to the acceleration of biological development (early maturers, n=9; normal, n=10; late maturers, n=7) and tested with a battery of 10 tests (6 motor, 1 functional, and 3 sport-specific). As was expected, even though there were no differences in experience and placement, the groups differed in all physical characteristics (Kruskal-Wallis ANOVA: age $p=0.01$; body mass, $p<0.01$; body height, $p<0.01$; sitting body height, $p<0.01$; body mass index, $p=0.02$). The groups differed significantly in two sport-specific tests and one motor test (Kruskal-Wallis ANOVA: wrestling bridge flexibility $p=0.02$; flipover $p=0.04$; medicine ball throw $p<0.01$). Although these were selected wrestlers, not all of them were classified as early maturers; rather, they were evenly distributed in different groups. We can assume that late maturers had technical-tactical advantages that compensated for the early maturers' advantage in explosive power. Early maturers were better in terms of explosive power, but the late maturers were better at sport-specific flexibility, as expected.