

# International Journal of Wrestling Science

Volume 14 Number 2, 2024



**INTERNATIONAL NETWORK OF WRESTLING RESEARCHERS (INWR)**

*ADVANCING OUR SPORT THROUGH KNOWLEDGE*

*FAIRE PROGRESSER NOTRE SPORT PAR LA CONNAISSANCE*

*ПРОДВИЖЕНИЕ НАШЕГО СПОРТА ЧЕРЕЗ ЗНАНИЕ*

*PROGRESO PARA NUESTRO DEPORTE MEDIANTE CONOCIMIENTO*

# International Journal of Wrestling Science

The official journal of the International Network of Wrestling Researchers (INWR)

David Curby, EdD

*Editor in Chief*

## EDITORIAL BOARD

Mario Baić, PhD, Croatia

Ioannis Barbas, PhD, Greece

Craig Horswill, PhD, USA

Fikrat Kerimov, PhD, Uzbekistan

Georgiy Korobeynikov, PhD, Ukraine

David Lopez-Gonzalez, Canada

Bahman Mirzaei, PhD, Iran

Ramazan Savranbaşı, PhD, Turkey

Yuri Shakhmuradov, PhD, Russia



UNITED WORLD  
**WRESTLING**



**INTERNATIONAL NETWORK OF WRESTLING RESEARCHERS (INWR)**

**ADVANCING OUR SPORT THROUGH KNOWLEDGE**

**FAIRE PROGRESSER NOTRE SPORT PAR LA CONNAISSANCE**

**ПРОДВИЖЕНИЕ НАШЕГО СПОРТА ЧЕРЕЗ ЗНАНИЕ**

**PROGRESO PARA NUESTRO DEPORTE MEDIANTE CONOCIMIENTO**

<https://unitedworldwrestling.org>

<http://inwr-wrestling.com>

Volume 14 Issue 2 2024 International Journal of Wrestling Science is published biannually by Curby Research Group, LLC, 1719 W.60th Street, La Grange, Illinois, 60525. Print ISSN - 2161-5667, Online ISSN - 2161-3524.

Copyright© 2024 The Curby Research Group, LLC. All rights reserved. International Journal of Wrestling Science is published using the open access model. All original scientific content is available free of charge for personal use without restrictions on the journal's website at: <http://inwr-wrestling.com> International Journal of Wrestling Science provides free, immediate and permanent online access to the full text of all articles distributed under the terms of the Creative Commons Attribution Non-commercial License <http://creativecommons.org/licenses/by-nc/4.0>, which permits use, distribution, and reproduction in any medium, provided the original work is properly cited, the use is non-commercial and is otherwise in compliance with the license. The publisher assumes no responsibility for any statements of fact or opinion expressed in the published papers. The appearance of advertising in this journal does not constitute an endorsement or approval by the publisher, the editor, or the editorial board of the quality or value of the product advertised or of the claims made for it by its manufacturer.

Permissions. For further information, please contact the Editor in Chief: [davcurb@gmail.com](mailto:davcurb@gmail.com) Instructions for authors can be found online at: <http://inwr-wrestling.com/wp-content/uploads/2018/03/IJWS-Aims-Scope-and-Guidelines-for-Authors.pdf>

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

## Reviewers

Nikos Aggelousis PhD (Greece)  
Euaggelos Almpantidis PhD (Greece)  
Ramin Amirsasan PhD (Iran)  
B.J. Anderson MD (USA)  
Mario Baić PhD (Croatia)  
Tibor Barna PhD (Hungary)  
Sylvia Bakalova PhD (Bulgaria)  
Ibrahim Cicioglu PhD (Turkey)  
Eckart D. Diezemann MD (Germany)  
Milorad Dokmanac PhD (Serbia)

Ali Dolatkah PhD (Armenia)  
Sergio Dos Santos PhD (Brazil)  
Mindaugas Ežerskis PhD (Lithuania)  
Emerson Franchini PhD (Brazil)  
Jeremy Frank MD (USA)  
José Maria Gullón PhD (Spain)  
Bruno Hartmann PhD (Austria)  
Kazunori Iwai PhD (Japan)  
Georgiy Korobeynikov PhD (Ukraine)  
Stefan Krist PhD (Austria)  
William J. Kraemer PhD (USA)

Bianca Miarka PhD (Brazil)  
Maria Michalopoulou PhD (Greece)  
Jonas Poderys PhD (Lithuania)  
Amir Rashidlamir PhD (Iran)  
William A Sands PhD (USA)  
Babak Shadgan PhD MD (Canada)  
Victor Shiyan PhD (Russia)  
Dao Chanh Thuc PhD (Vietnam)  
Mehmet Türkmen PhD (Turkey)

---

# International Journal of Wrestling Science

The official journal of the International Network of Wrestling Researchers (INWR)

---

Volume 14, Number 2 2024

## TABLE OF CONTENTS

- 1 Editor's Comments  
*David Curby*
- 2-18 CONSIDERATIONS IN THE ESTABLISHMENT OF WEIGHT CLASSES FOR WRESTLING AND OTHER OLYMPIC COMBAT SPORTS, AND MEASURES TAKEN TO SAFEGUARD THE HEALTH OF THESE ATHLETES IN MAKING WEIGHT  
*David G. Curby*
- 19-28 STRUCTURE OF WON MEDALS, MOST SUCCESSFUL TEAMS, AND WRESTLERS BY CONTINENTS AT THE OLYMPIC GAMES 2024  
*Kristijan Slacanac & Milorad Dokmanac*
- 29-39 ANALYSIS OF THE OLYMPIC GAMES – PARIS 2024 GR-FS-WW  
*Milorad Dokmanac*
- 40-44 PSYCHOPHYSIOLOGICAL STATES OF ELITE WRESTLERS AFTER CRITICAL LIFE EVENTS  
*Georgiy Korobeynikov, Oleg Kokun, Ivanna Korobeinikova, Lesia Korobeinikova, & Markus Raab*
- 45-47 COMMENTARY  
PROPOSAL FOR CHANGES IN COMPETITION SYSTEM AND WRESTLING RULES FOR 2025  
*Milorad Dokmanac*
- 48-49 COMMENTARY  
PROPOSAL FOR THE FORMATION OF CATEGORIES IN WOMEN'S WRESTLING ACCORDING TO STATISTICS AND ANTHROPOLOGICAL CHARACTERISTICS BY CONTINENT  
*Ioannis Barbas*

# Editor's Comments

Welcome to the post-Olympic issue of the International Journal of Wrestling Science! It contains two comprehensive analyses of the scoring from Paris. The spectacular performance of the Japanese teams is shown in these analyses.



The Japan wrestling team in Paris, which won a record eight gold medals and 11 medals overall. (photo by Sachiko HOTAKA)

Among all the gold medalists, Rei Higuchi (FS 57 kg) from Japan stands out for his exceptional efficiency, with a Wrestling Quotient of 1.89 pts/min, significantly higher than the others.

On the cover is Kotaro KIYOOKA, left, scores with a unique high-leg roll in the 65kg FS final against 2022 world champion Rahman AMOUZAD (IRI). (photo by Sachiko HOTAKA).



History was made by Mijaín López of Cuba who won his fifth consecutive Olympic Gold Medal. Here he is shown retiring in traditional form. Gracias

Finally, presentations and commentary from the UWW Scientific Commission held at the World Championships in Tirana are included.

Sincerely yours in the advancement of Wrestling,

*David Curby*



David Curby EdD  
Director of the International Network of Wrestling Researchers  
davcurb@gmail.com

# Considerations in the Establishment of Weight Classes for Wrestling and other Olympic Combat Sports, and Measures Taken to Safeguard the Health of These Athletes in Making Weight

David G. Curby  
 International Network of Wrestling Researchers (INWR)  
 Secretary of the United World Wrestling Scientific Commission  
 Editor in Chief of the International Journal of Wrestling Science

davcurb@gmail.com

## BACKGROUND

Weight classes are used in several Olympic sports. These include the combat sports of wrestling, boxing, judo, taekwondo, and also weight lifting. They are ostensibly used to provide for fair competition, fair opportunity for athletes of various sizes to become champions, and provide safety for the participants. Table 1 lists these sports and the weight classes currently used in competition. One can see that the range of classes for men extends from 51 kg to unlimited, and women from 48 kg to unlimited. There are also differences in the classes used between a sports world championships and the Olympic Games.

Table 1. Men's Olympic Sports Utilizing Weight Classes (Paris Games)

Sport	Men's Classes (kg)							# Classes
Boxing	51	57	63.5	71	80	92	+92	7
Judo	60	66	73	81	90	100	+100	7
Taekwondo	58	68	80	+80				4
Weightlifting	61	73	89	102	+102			5
Wrestling								
Freestyle	57	65	74	86	97	125		6
Greco Roman	60	67	77	87	97	130		6

Table 2. Women's Olympic Sports Utilizing Weight Classes (Paris Games)

Sport	Women's Classes (kg)							# Classes
Boxing	50	54	57	60	66	75		6
Judo	48	52	57	63	70	78	+78	7
Taekwondo	49	47	67	+67				4
Weightlifting	49	59	71	81	+81			5
Wrestling								
Freestyle	50	53	57	62	68	76		6



Boxing, weightlifting and wrestling have been long-standing sports in the Olympic program, and over the years, expanded their weight classes. At their peaks boxing had 12 classes, weightlifting and wrestling had 10. Both judo and taekwondo are relative newcomers, judo joined the Olympic program in 1964 and taekwondo in 2000.

There has been a tremendous growth of the Olympic Games in the number of disciplines, events within disciplines and the number of athletes. Table 3 shows the evolution of weight classes used in wrestling since the first modern Olympics. In those Games held in Athens in 1896, there was only a single class, without limits. The number of classes grew incrementally, reaching a high of 10 classes in 1969. The number of classes remained at 10 until 1997.

In Athens 1896, there were 242 participants from 11-14 countries, with no women. Just over 60 years later in Rome there were 84 nations represented with a total of 5,388 athletes-4727 men and 611 women and in another 60 years in Tokyo, there were 11,037 athletes from 206 nations-5,651 men and 5,386 women. Additionally, the Paralympic and Olympic games have taken place in the same host cities and venue since the Summer Games of 1988. In Paris there will be approximately 4,400 Paralympians.

Wrestling is the only sport in this group (with the exception of Women's Boxing) that has set a limit on the highest weight (first done in 1985). It was first imposed in 1985 with a limit of 130 kg. It was further reduced to 120 kg in 2002. Up through 2013, the weight classes between Freestyle and Greco Roman were the same, in 2014 they were changed, and the highest class became 125 in Freestyle and 130 in Greco Roman.

Table 3. Evolution of Men's and Women's Weight Classes Used in Olympics and World Championships (from UWW Database: <https://unitedworldwrestling.org/DataBase>)

<b>Men</b>			
<b>Year</b>	<b>Event</b>	<b># Classes</b>	<b>Classes (kg)</b>
1896	Olympic Games	1	
1904	World Championships	2	75, +75
1905	World Championships	3	68, 80, +80
1908	World Championships	2	75, +75
1908	Olympic Games	4	66.6, 73, 93, +93
1909	World Championships	2	75, +75
1910	World Championships	4	60, 70, 85, +85
1911	World Championships	5	60, 67, 73, 83, +83
1913	World Championships	4	68, 75, 82.5, +82.5
1920	World Championships	5	60, 67, 75, 82.5, +82.5
1921	World Championships	6	58, 62, 68, 75, 82.5, +82.5
1950	World Championships	8	52, 57, 62, 67, 73, 79, 87, +87
1962	World Championships	8	52, 57, 63, 70, 78, 87, 97, +97
1969	World Championships	10	48, 52, 57, 62, 68, 74, 82, 90, 100, +100
1985	World Championships	10	48, 52, 57, 62, 68, 74, 82, 90, 100, 130
1997	World Championships	8	54, 58, 63, 69, 76, 85, 97, 130
2002	World Championships	7	55, 60, 66, 74, 85, 96, 120
2015	World Championships	8	57, 61, 65, 70, 74, 86, 97, 125
2016	Olympic Games	6 Greco-Roman	59, 66, 75, 85, 98, 130
		6 Freestyle	57, 65, 74, 86, 97, 125
2018	WC Freestyle	10	57, 61, 65, 70, 74, 79, 86, 92, 97, 125
	WC Greco Roman	10	55, 60, 63, 67, 72, 77, 82, 87, 97, 130
2021	Olympic Games	Greco Roman 6	60, 67, 77, 87, 97, 130
		Freestyle 6	57, 65, 74, 86, 97, 125

Women			
Year	Event	# Classes	Classes (kg)
1987	1st World Championship	9	44, 47, 50, 53, 57, 61, 65, 70, 75
1997	World Championships	6	46, 51, 56, 62, 68, 75
2002	World Championships	7	48, 51, 55, 59, 63, 67, 72
2004	1st Olympic Games	4	48, 55, 63, 72
2014	World Championships	8	48, 53, 55, 58, 60, 63, 69, 75
2016	Olympic Games	6	48, 53, 58, 63, 69, 75
2018	World Championship	10	50, 53, 55, 57, 59, 62, 65, 68, 72, 76
2021	Olympic Games	6	50, 53, 57, 62, 68, 76

Towards the end of the 20th century this rapid growth of the Olympics and international sport were feeling new social pressures. Beginning in 1997 we see a decline in the number of classes from 10 to 8, then to 7 in 2002. This trend continued through 2016 with weight classes in the Olympic Games reduced to 6. Two major forces were at work here: 1) The need to reign in the explosive growth of the Olympic Games; and 2) The drive for gender equity in sport.

“Gigantism” in the Olympic Games was seen with escalating costs (see Figure 1) and unsustainable development. Attempts to shrink the Olympics could be seen in efforts to control the number of athletes through quotas and qualification tournaments, reducing weight classes and even eliminating entire sports from its program. In wrestling, this was approached in two ways. A quota was first put in place for the 1992 Olympic Games that set limits on the number of competitors. The process was conducted through a qualification system whereby athletes qualified a weight class for their country through designated competitions.

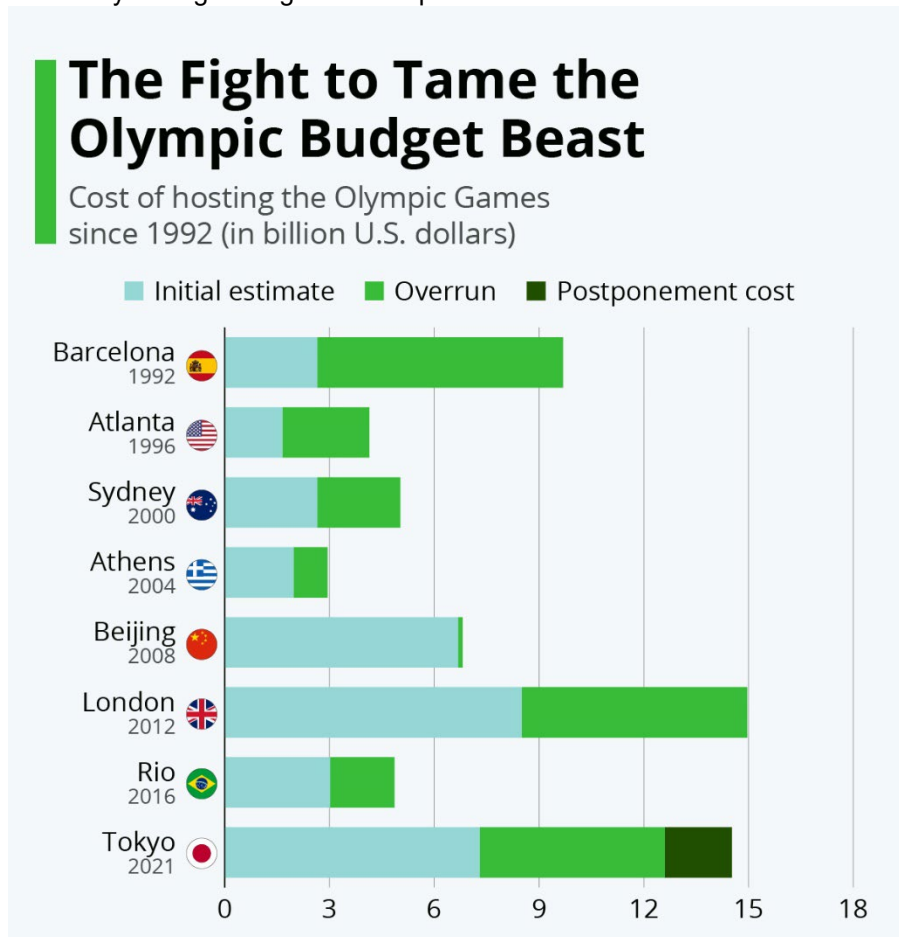


Figure 1. Costs of hosting Olympic Games excluding infrastructure projects such as airports, roads and rail. statista.com

Wrestling faced its own challenge in 2013. In 2013, the International Olympic Committee voted to remove wrestling from the Olympics, even though it had been contested at every Games since 1904. But the IOC relented after world wrestling officials promised changes to the Olympic format to make matches faster and added more weight classes for women's wrestlers.

Seven months after losing its Olympic place, wrestling was reinstated for the 2020 Games in an IOC meeting in BUENOS AIRES, Argentina. As part of its effort to retain Olympic status, the International Federation of Associated Wrestling Styles (FILA) made a recommendation to the IOC that the number of women's weight classes be increased, and on August 9, 2013 the IOC Executive Board acted on this request and added two weight classes to the women's Olympic program, and announced that women's freestyle would include six weight classes in the 2016 Olympics. In order to achieve this, the men's disciplines of freestyle and Greco-Roman were reduced by one weight class, from seven to six each. This action reflects the high value that the International Olympic Committee places on gender equity within its sports on the Olympic program.

### **Women in Olympic Combat Sport**

Women joined combat sport in the Olympics when women were added to the Judo program in 1992 and have enjoyed the same number of weight classes (7) as men since that time. Taekwondo was added for both men and women in 2000 with 4 classes for each. Women's Wrestling was added in 2004 with 4 classes. Women's Boxing was added in 2012 with 3 classes (Interestingly, there were 3 distinct intervals with gaps between them: 48-51, 57-60, 69-75). Gender equity will be attained in Paris.

### **Problems with Weight Loss**

Unhealthy weight loss practices have been a part of wrestling since the formation of weight classes. Excessive weight loss, too rapid weight loss, dehydration, the use of diuretics and laxatives, and the cycling of weight (repeated rapid loss and gain) have been problematic in the sport and have been documented as far back as 1930. (Kenney, H. E. (1930). "Problem of making weight for wrestling meets." JOHPER 1(3): 24-25; 49.).

The effort to maximize the performance of wrestlers has at its core the maximization of the power to weight ratio in wrestlers. Diet and training are used to lose excess body fat and to maximize lean muscle tissue. Problems have occurred when rapid weight loss (RWL) methods have been used in order to obtain a perceived size and power advantage over an opponent by moving to a lower weight class. Another reason would be to fill a gap in a line up where there is not a competent wrestler. Extreme dehydration induced through exercising in hot environments or impermeable clothing, the use of saunas and fluid restriction are some of the extreme methods used and their effects have been quite well documented. Fatigue, irritability, decrements in performance, decrements in academic performance and quitting the sport are some of the most obvious problems.

These effects of these practices reached a zenith in 1997 when three American collegiate wrestlers suffered hyperthermia and dehydration-related deaths as they attempted to make their weight class limit (Remick et al., 1998).

### **SOLUTIONS**

Position papers have been issued by the:

American Medical Association-MA, A. M. A.-C. o. M. A. o. S. (1967). "Wrestling and weight control." JAMA 201(7): 131-133.

American Association of Pediatrics- AAP, C. o. S. M. a. F. A. A. o. P. (2005). "Promotion of healthy weight-control practices in young athletes." Pediatrics 116: 1557-1564.

American College of Sports Medicine. Position statement: weight loss in wrestlers. Med. Sci. Sports 8:xi-xiii, 1976.

ACSM Position Stand on Weight Loss in Wrestlers (1996). Medicine and Science in Sport and Exercise, 28(2), ix-xii.

ACSM Expert Consensus Statement on Weight Loss in Weight-Category Sports Current Sports Medicine Reports 20(4):p 199-217, April 2021.

In a 2013 paper by the Ad Hoc Research Working Group on Body Composition, Health and Performance, under the auspices of the IOC Medical Commission, several procedures were advanced to manage weight loss.





- shortening the time between the weigh-in and competition;
- introducing more weight classes so that there are smaller gaps between weight classes;
- not allowing athletes multiple attempts to weigh-in, which may make the process more difficult for athletes losing larger amounts of weight;
- checking weight at an allocated point before the bout and then only allowing athletes to lose a certain amount of weight from there [23,64];
- the implementation of athlete education programs to encourage athletes and support staff to choose safer weight loss practices [23] and;
- implementing hydration testing requirements for athletes to compete (Sundgot-Borgen, et al., 2013).

## **Weigh in Procedures and Protocols**

### **Boxing**

There is a weigh-in on each day of competition. All boxers must weigh in on the day they box.

### **Wrestling**

The day before competition weigh-in was the procedure used up until 2018, when United World Wrestling moved to a morning weigh-in on the day of competition. Competition for each weight class was completed in one day. This has been subsequently modified to a two-day format with repechage and medal matches be conducted on the second day, along with another weigh-in in for those still competing.

### **Judo & Taekwondo**

Both Taekwondo and Judo (2013) utilize weigh-in procedure where all athletes participate in a general weigh-in on the day preceding competition. On the morning of the day of competition there will be a random weigh-in 1 hour before the start of competition for those selected to weigh-in with a 5% tolerance over the weight class limit. In Judo, 4 athletes from each weight class will be randomly selected, while in Judo a) More than 32 athletes: 20% of total b) 17-32 athletes: 6 athletes c) 9-16 athletes: d. 4-8 athletes: 2 athletes e. Below 4 athletes: none.

Rationale for weigh-in tolerance for random weigh-in

There are studies:

Based on our systematic review and meta-analysis of the literature, RWL up to 5% of the body mass in less than 7 days does not influence performance outcomes in Official Olympic combat athletes with weight classes, considering the strength and power measures (Mauricio, et al., 2022).

Hypohydration is highly prevalent among combat sports athletes at weigh-in and not fully reversed in the 13–18 h from weigh-in to competition. Nonetheless, partial rehydration recovers upper and lower body neuromuscular performance in the severely hypohydrated participants (Pallarés, et al., 2016)

### **Effectiveness**

The results showed that elite judo athletes resort to rapid weight loss and present dehydration despite established regulations by the IJF. (Ceylan, et al., 2023)

This amount of reduction is probably related to two aspects: (a) weight categories in judo present nearly 10% increments in body mass. Thus, athletes in the middle of two weight categories limits are more prone to reduce their body mass instead of trying to increase it; (b) per rule, athletes can be 5% above the weight category upper-limit in the day of competition. Therefore, those reducing nearly 5% will in fact compete in their “walking weight”. However, it is important to consider that, in the present study, body mass measurements were conducted from 5 days to the competition up to the competition, and some athletes may have started to reduce their body mass before this period. Conversely, only 17.6% of the judo athletes declared they would participate in a tournament in a heavier weight category if the official weigh-in was conducted in the day of competition, suggesting that for most of the athletes the decision regarding using RWL procedures is not affected by the moment of the weigh-in (Bialowa, et al., 2023)

## **WEIGHT CERTIFICATION SYSTEMS**

Efforts have been made to establish a safe, minimal weight for wrestlers. Iowa, through the work of Tipton & Tcheng (1969, 1970) had explored the use of a minimum wrestling weight formula utilizing body composition since 1968. The Wisconsin Interscholastic Athletic Association adopted a mandatory minimal weight program in 1991. This included rules and an educational program, consistent with ACSM and AMA guidelines, to curtail "weight cutting" among high-school wrestlers. The project included skinfold estimates of body fatness to establish a minimum competitive weight, a limit on weekly weight loss, and nutrition education information. This program received

widespread endorsement from parents, teachers, wrestlers, and coaches. The success in Wisconsin became a model for other states and the NFHS to follow (Oppliger, Harms, Herrmann, Streich, Clark, 1995) The National Federation of High Schools (NFHS) established a rule for implementation in the 2004-05 season the wrestling (1-3-1) that each individual state high school association shall develop and utilize a specified weight- control program which will discourage excessive weight reduction. Programs must establish a minimum weight class through hydration testing, body fat assessment and a monitored descent plan. In 1998, the National Collegiate Athletic Association adopted a minimum weight program after the deaths of three male wrestlers who died while making weight.

#### NCAA Wrestling Weight Management Program

The original established principles of the NCAA Weight Management Program outline sensible alternatives to dehydration weight loss.

- Enhance safety and competitive equity;
- Minimize incentives for rapid weight loss;
- Emphasize competition, not weight control; and
- Implement practical, effective and enforceable guidelines.
- 

The NCAA Weight Management Program goals (established in 1998)

- Establish weight classes that better reflect the collegiate wrestling population;
- Establish a permanent healthy weight class early in the season with time to achieve it safely;
- Establish weigh-ins as close to the start of the match as possible, and use a random draw for weight class order;
- Eliminate the tools used to accomplish rapid dehydration.

#### Optimal Performance Calculator

The National Wrestling Coaches Association developed an on-line program that colleges can use to administer the NCAA Wrestling Weight Management Program, as well as the various state programs (see National High School Federation).

Baseline weight is made in hydrated state: Urine Specific Gravity 1.20 using refractometer to provide a valid specific gravity value. Note: Test strips are not permissible as a measuring device for specific gravity.

Men:

Body density may be calculated by either (a) skin-fold measurement with calipers approved by medical personnel; (b) underwater weighing with a direct measure of residual volume; or (c) bod pod analysis. Option A: Skin-folds. • Skin-fold measurements- triceps, subscapular, abdomen, repeat series two more times). The Lohman three site equation will be used to predict body density and the Brozek equation will be used to convert body density to percent body fat. A minimal wrestling weight calculation based on 5 percent body fat is established with 1.5% weekly descent.

Women:

Minimum Wrestling Weight is determined at 12% body fat • Skin Fold Measurements are taken at a 2-site location Subscapular and Triceps and use the equation from Slaughter, Lohman & Boileau (1988).

#### High School Programs

The National High School Federation (NFHS) Wrestling Rules (Rule 1, Section 5, Articles 1-3) outline the process for discouraging excessive weight loss and establishing a safe minimum weight which involves the wrestler, parents/guardians, appropriate health-care professional and coach. An ideal program would be one where an appropriate health-care professional would assist in establishing a minimum weight class through hydration testing prior to the beginning of the season combined with body fat assessment and a monitored descent plan. Minimum body fat should not be lower than seven percent for males or 12 percent for females. There are a variety of methods employed by the state associations.

A survey of the 49 state associations conducting high school wrestling programs was made to determine the methods used for the 2010-11 season to assess hydration status and body composition, as well as the administrative procedures employed to meet this weight management mandate. Methods: Information was obtained from state association websites, which was followed by phone interviews with state administrators. Results: Multiple methods are approved for use in the majority of programs. Urine specific gravity to assess hydration is tested by a refractometer (33 states), reagent strip (28 states), urinometer/hydrometer (6 states), color chart (5 states), and is

not tested in 4 state programs. Body fat is assessed through caliper measures of skinfolds (35 states), bioelectric impedance (24 states), hydrostatic weighing (21 states), air displacement plethysmography (12 states), physician observation (7 states), DXA (4 states), ultrasound (3 states), near infrared interactance (1 state), and one program does not consider body fatness. 36 states utilize the National Wrestling Coaches Association Optimal Performance Calculator™ to manage their program. Many states apply a variance to the recommended weight at the body fat minimums of 7% and 12% for males and females respectively, ranging from a 0.9 to 5% reduction in these values. For males in the 35 programs utilizing skinfold measures, 34 use the Lohman equation, and 1 uses the Forsyth-Sinning equation. For females, the Boileau equation is used in 32 programs, the Jackson, Pollock, and Ward equation is used in one program, and two programs are inappropriately using equations developed for use by males, with the females. In programs utilizing bioelectric impedance, 12 use the standard setting while 12 the athletic setting (Curby, 2012).

### **Effectiveness of Programs**

The implementation of the NCAA Wrestling Weight Control Program led to RWL and rapid weight gain (RWG) that were reduced significantly over previous investigations with only mat-side weigh-ins. The NCAA weight management program appears effective in reducing unhealthy weight cutting behaviors and promoting competitive equity. Efforts to institute similar programs among younger wrestlers seem warranted (Oppliger., et al., 2006)

Kondo et al. provided data showing that weight regain was reduced with the UWW implementation of same day weigh-ins.

Kondo E, Nishimaki M, Yamashita D, Nakajima K. The link between the range of rapid weight loss and physical conditions of elite wrestlers during competition under the morning weigh-in rule. *The Journal of sports medicine and physical fitness* 2021;61(1):117-23 doi: 10.23736/S0022-4707.20.11221-0

Artioli et al., (2016) called for implementation of the NCAA-type weight control program in international wrestling.

### **PROBLEMS**

#### **Women's wrestling body fat percentage and minimum wrestling weight**

Some experts are questioning the 12% minimal body fat in current use for women. Sin the early years in the development of weight certification programs, sports medicine experts using theoretical minimal body fat levels for proper physiological functioning had suggested a 3% minimum for males and 12% body fat for women. The 12% value was initially set using theoretical models, limited cadaver analyses, and the assumption that 12% would provide an adequate mass of stored energy and lipid precursors to sustain good health and performance in female athletes (McArdle, Katch, & Katch, 1991).

12% body fat is unlikely and rare and that the minimum should be reconsidered for safety among female wrestlers. This does not mean prohibiting a female wrestler from competing at 12% body fat if naturally occurring. A higher minimum would offer more protection from excessive leanness, energy restriction, or coercion to pursue a weight class at 12% body fat (Problems Physiological Minimums for Body fat Horswill, C. A. and A. E. Roedeshimer (2022). "Rethinking the 12% Body-Fat Minimum for Female Wrestlers." *Current Sports Medicine Reports* 21(1): 8-11.

The following research (Jagim, et al., 2024) gives support for increasing the minimal wrestling weight be based on a 17% body fat minimum for women. A BF% of 17% may be needed for menarche with ~20% required for the maintenance of normal menstrual cycle function, which is well above the 12% currently used in wrestling.

A total of 1,683 collegiate women wrestlers were included in the analysis. Data were extracted from the weight certification submission system (Optimal Performance Calculator [OPC]) provided by the NWCA from the 2022–2023 collegiate season.

The median BF% was 27.4% with findings from the current study indicating that 95% of the female wrestlers from the 2022–2023 pre-season were above 17% body fat. This is a noteworthy observation, as when traditional probability is applied we conclude that it is a rare event to find women wrestlers below 17% body fat when using the current standard practices for BF% determination. Yet 12% body fat is currently used as the threshold for determining the minimal wrestling weight class in women].

Nearly all (>95%) BF% values were above the 12% threshold currently used to determine MWW by the NWCA. Additionally, very few wrestlers competed in their lowest allowable weight class division throughout the season.

## **Hydration Status**

While initial measurements are based from a euhydrated state, subsequent making of weight can rely on dehydration. What is needed is technology to make an accurate, quick and non-invasive measure of hydration status that can become a part of the weigh-in process.

## **ESTABLISHMENT OF WEIGHT CLASSES**

The use of weight classes is based on an assumption that differences in body weight can create an unfair advantage for the larger wrestler, and therefore the establishment of weight classes is a rationale solution to this inequity created by differences in size. When looking at the history of hand-to-hand sports, in ancient times, they ignored the advantage that larger and stronger men most often possessed (Sayenga, 1995). Sayenga links what he views as an excessive number of weight classes with the duration of bouts. In ancient times, there were no time limits. Time limits were established in order to accommodate the increased number of matches. This mandated a need for an arbitrary judging system to select a winner. This has taken the decision away from the athletes themselves, not to mention reducing the importance of endurance. The records of wrestling in England throughout the 19th century show that two classes were generally used, a lightweight and heavyweight.

In order to address the problem from a scientific standpoint, it seems that the establishment of weight classes for world class competition for mature men and women requires two sets of information. (1) Use population distributions to ensure fairness of access; and 2) Determine a means of scaling the effects of differences in body weight to equilibrate these effects in a competitive situation to achieve safety and performance equity. This second approach is not easily defined. Additionally, these two approaches can be contradictory.

## **Use of Population Distributions to Identify the Possible Wrestling Athletes**

Population statistics from the United States were used in this analysis (NHANES III 1994 Survey). There are limitations posed by such data, 1) How representative is it of the athletic population? and 2) How generalizable is it to the entire world of wrestling? Data listing the distribution of body mass (weight) for the age range of the competitors was studied. The range of data selected was for the span of 20-29 years of age and is listed in Table 4.

Table 4. Weight (kg) at each centile for U.S. men and women aged 20-29 years

Centile	Men	Women	Centile	Men	Women	Centile	Men	Women
1	52.95	42.40	34	69.95	56.30	67	82.05	66.45
2	54.95	44.05	35	70.25	56.45	68	82.35	67.23
3	55.95	45.00	36	70.50	56.65	69	82.80	67.70
4	57.20	45.95	37	71.10	57.05	70	83.05	68.05
5	57.70	46.65	38	71.45	57.30	71	83.80	68.45
6	58.50	47.25	39	71.81	57.55	72	84.05	69.25
7	59.40	47.80	40	72.15	57.65	73	84.35	69.65
8	59.90	48.10	41	72.40	57.85	74	84.90	70.70
9	60.35	48.55	42	72.65	57.90	75	85.60	71.55
10	60.95	49.10	43	73.20	58.35	76	86.30	72.30
11	61.80	49.55	44	73.60	58.60	77	86.70	72.90
12	62.00	49.75	45	73.90	58.85	78	87.45	73.65
13	62.40	49.80	46	74.15	59.15	79	88.35	74.60
14	62.75	50.45	47	74.25	59.45	80	89.60	75.20
15	63.10	50.55	48	74.65	59.75	81	90.25	75.95
16	63.85	50.80	49	74.85	59.85	82	90.75	76.50
17	64.15	51.20	50	75.35	60.50	83	91.90	77.75
18	64.70	51.55	51	75.70	60.80	84	92.50	78.50
19	65.00	52.10	52	76.15	61.10	85	93.65	79.85
20	65.50	52.35	53	76.60	61.65	86	94.45	80.45
21	65.70	52.45	54	76.95	62.00	87	95.45	81.05
22	66.05	52.75	55	77.25	62.65	88	96.60	82.90
23	66.40	53.20	56	77.60	63.05	89	98.05	84.35
24	66.80	53.40	57	77.90	63.30	90	99.40	86.60
25	67.10	53.60	58	78.05	63.55	91	101.10	88.65
26	67.50	53.90	59	78.45	63.80	92	102.85	90.65
27	67.75	54.30	60	79.05	64.15	93	104.70	91.80
28	67.90	54.75	61	79.60	64.55	94	105.95	94.55
29	68.10	55.05	62	80.00	64.95	95	107.70	99.05
30	68.55	55.25	63	80.35	65.10	96	112.40	100.15
31	69.10	55.50	64	80.75	65.45	97	115.50	102.05
32	69.30	55.75	65	81.05	65.90	98	123.00	105.05
33	69.70	56.15	66	81.30	66.25	99	130.45	114.65

Another use of these data is to create a model based on an equal distribution of the population within the weight class system. This approach would be an attempt to address the issue of fairness. If one were to create a fair system, a first approach could be to divide the population into the number of classes deemed necessary. For this hypothetical model, ten weight classes were developed. The procedure was to divide the distribution into eight classes (each class containing approximately 12% of the distribution) and also add a class at each tail of the distribution. The results of this approach are shown in tables 5 and 6.

Table 5. Population Equity Model for 10 Weight Classes

Percentile	Men	Women
2	55	44
12	62	50
24	67	53.5
36	70.5	56.5
48	74.5	60
60	79	64
72	84	69
84	92.5	78.5
96	112	100
98	123	105

Table 6. Population Equity Model for 6 Weight Classes

Percentile	Men	Women
16.5	64	51
17-33	70	56
34-49	75	60
50-66	81	66
67-83	92	78
84-99	130	115

How well the current world championship weight classes used by UWW address the potential population pools are shown in figs. 2 and 3. One can see that the potential number of athletes is much higher in the middle weights. The men's 86 kg class has the highest potential with 30% of the population. One could use this in support for more weight classes in this region to make the access to success more equitable.

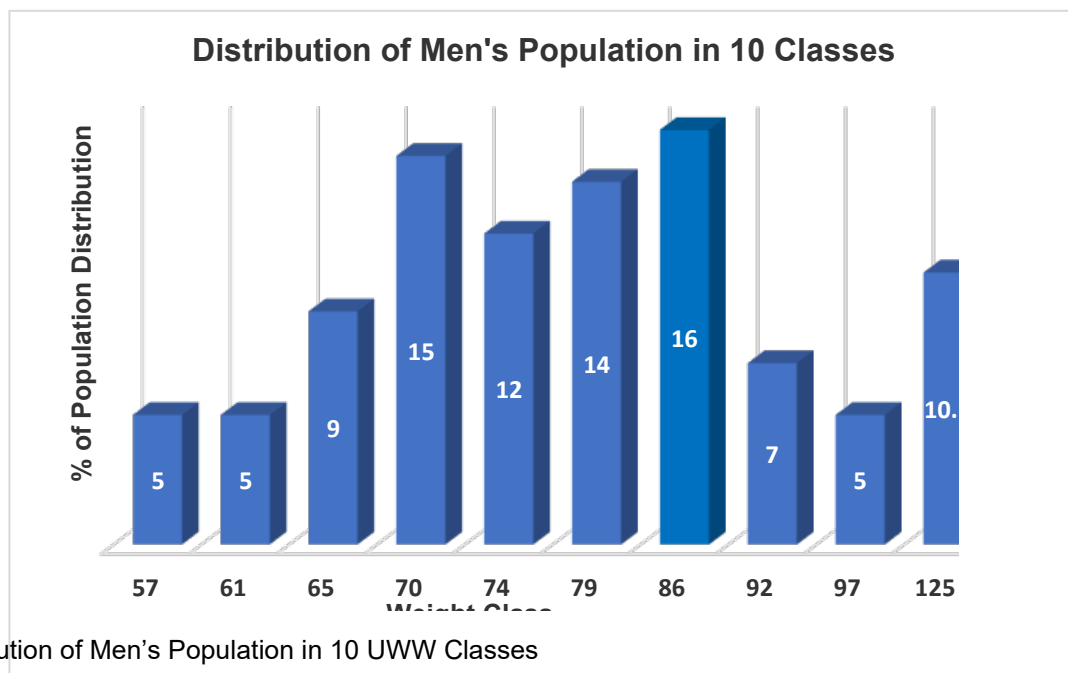


Figure 2. Distribution of Men's Population in 10 UWW Classes



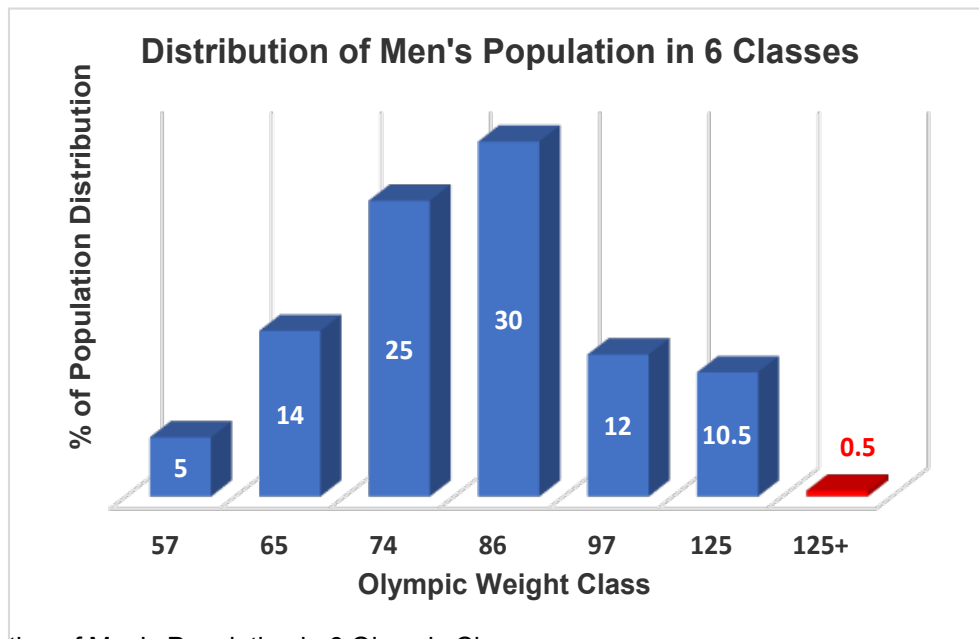


Figure 3. Distribution of Men's Population in 6 Olympic Classes

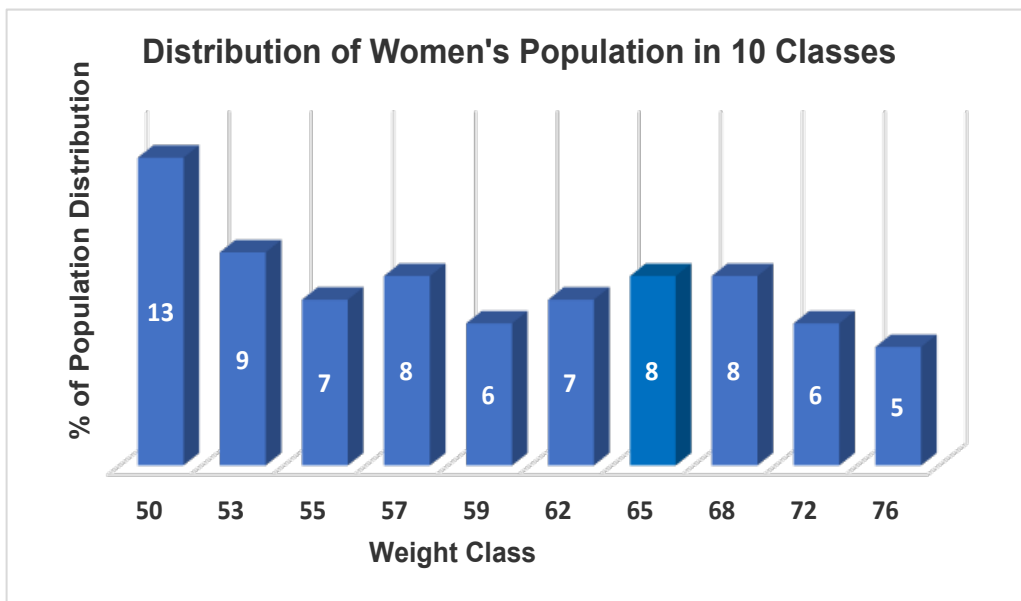


Figure 4. Distribution of Women's Population in 10 UWW Classes

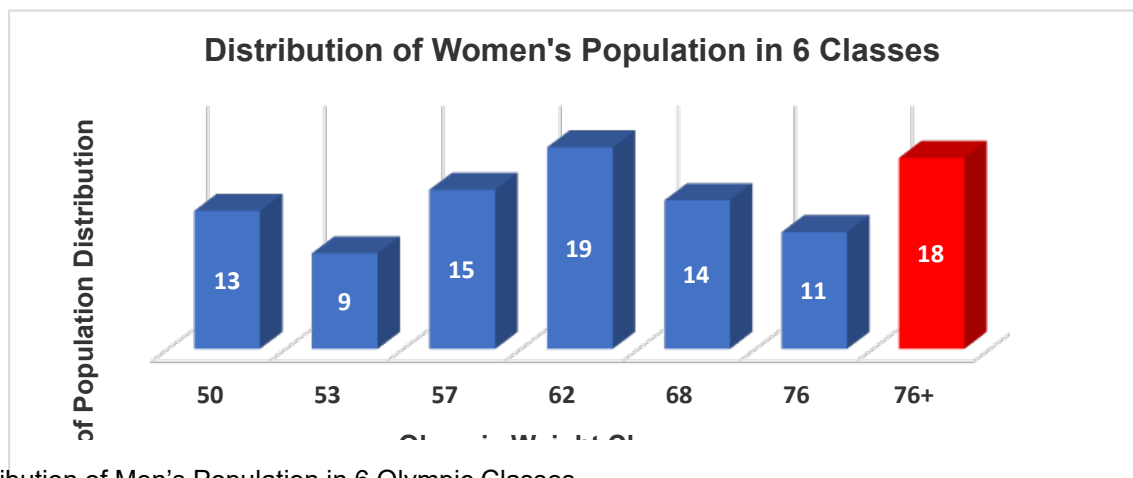


Figure 5. Distribution of Men's Population in 6 Olympic Classes

The distribution of women's weight classes seems to be better than for men in regards to the population. The inclusion of a lower weight class for women (48 kg), and support could also be given to adding an additional class somewhere between 70-85 kg for men.

### Highest Weight Class for Women

There is a better dispersion of the potential population for women's wrestling. It is interesting to note that the largest proportion of women in this population fall outside of the competitive limits of 76 kg. Data has been shown that indicates a need for a higher ceiling or cap to the highest weight class for women. Discussion needs to be focused on the question of whether the population data is truly representative of the pool of potential athletes. If the people above 76 kg are not likely to be athletes, it would not be appropriate to increase the weight class.

If one examines female athletes in a variety of sports, it is apparent that the range of weights of some outstanding female athletes extends beyond the 76 kg limit. Here are some examples from recent Games:

London: Football-Abby Wambach of the USA 81kg; Rowing-Heather Stanning of UK, 75kg; Swimming- Allison Schmitt of the USA, 75 kg; Tennis-Venus Williams 74 kg and Volleyball-Fabiana Claudino of Brazil, 73 kg.

Rio: Mélina Robert-Michon of France, Silver medal in Discus; Sandra Perković of Croatia-Discus-2x Gold then Bronze in Rio 85 kg; Javelin- Barbora Špotáková of the Czech Republic, 80 kg; Émilie Andéol of France was +78 Judo Gold in Rio-85 kg; Anita Włodarczyk, Poland, Hammer Throw Gold-100kg; Valerie Adams, NZ Shot Put Gold-120 kg.

([https://en.wikipedia.org/wiki/Summer\\_Olympic\\_Games](https://en.wikipedia.org/wiki/Summer_Olympic_Games))

In the USA and Canada collegiate women's wrestling nationals have weight classes higher than FILA's 76 kg limit. Professor Bruno Hartmann, a long-time coach of women in Austria, recommended the raising of the women's limit to 80 kg, citing drastic weight loss in order to be able to participate by some women (Hartmann, personal communication, 2017).

Table 7. NCAA Weight classes for women's college wrestling for the 2024-25 season.

Weight Class	
49 kg	103 lbs
50 kg	110 lbs
53 kg	117 lbs
56 kg	124 lbs
59.5 kg	131 lbs
62.5 kg	138 lbs
65.9 kg	145 lbs
72.5 kg	160 lbs
81.4 kg	180 lbs
93.5 kg	207 lbs

Discussion needs to be focused on the question of whether the population data is truly representative of the pool of potential athletes. If the people above 76 kg are not likely to be athletes, it would not be appropriate to add an additional weight class.

### Lowest Weight Class for Men

Prior to the contraction of weight classes, as well as the Olympic quota and qualification per weight class, the weight classes at the extremes, while having fewer entrants, were still represented with a seemingly sufficient number of competitors (see Table 6). These competitors have distinguished themselves in the annals of wrestling lore-Issaev (Bul), Javadi (IRI), Dimitriev and Kornilav (URS), Kim (PRK) and Berceanu (Rom) all at 48 kg. It is worth noting that the highest points per match in the 1995 WC were from the 48 kg weight class. There is a world-wide secular trend towards larger people. However, many athletes may be lost to the sport of wrestling because of the elimination of the 48 kg weight class and this is an area that deserves additional research.

Further study should include population data from other countries. While there is only 2.1% of this population in the lowest weight class, one must remember that this is U.S. data. Other data sets need to be investigated. It is likely that some countries have body mass distributions that have smaller people. Population data from Asian countries of such as Japan seem to indicate a smaller population. For instance, athletes from the Peoples Republic of Korea

won the FS 48 kg weight class in the 1986 and 1987 World Championships, and also the 1992 and 1996 Olympic Games.

#### Lowest Weight Class for Women

While the history for women is not as long, the original weight class in 1987 used 44 kg.

#### Highest Weight Class for Men

Beginning with the 1985 world championships, FILA instituted a maximum weight of 130 kg (286 lbs.) for the highest weight class. It is not clear how the limit was established by FILA, although a doctor on the FILA Medical Committee stated that it was due to the disparate sizes seen when the huge Chris Taylor wrestled for the US in the 1972 Olympic Games at a weight of 196 kg (Nickhah, personal communication, 2003).

A similar limitation was made for U S collegiate wrestlers in 1986, when the NCAA established the 275 lb. class (123.8 kg) then raised to 285. Health and safety of the participants was cited by the NCAA Committee on Competitive Safeguards and Medical Aspects of Sports in the development of this rule change. This entailed concern for the potential mis-matches in size, as well as the personal health risks present in an athlete is in the 150-200 kg range. In regard to the former, there was no data cited that document excessive weight difference causing injuries in the heavyweight class. The concern for the health of the athlete outside of competition centered around the following: 1) encourage the athletes who were obese to move towards a lower, and healthier weight and lifestyle; 2) discourage the practice of artificially inflating the athlete's size by way of tremendous caloric intake; and 3) discourage the use of ergogenic aids, such as anabolic steroids, in their quest to become larger. There is no data that has tracked the success of the rule change in achieving the goal in 1. While there are some athletes who have lost weight to wrestle in this class, many of these huge athletes probably just quit the sport.

Possible negative effects of this weight class restriction include, 1) a reduced pool of potential athletes, and 2) going against the trend one sees in many sports with larger athletes. One can look at the National Football League in the USA and see that 140kg linemen are the norm. While some of these men are obese, because of sophisticated weight training programs, one can see many who possess minimal fat, along with great speed and quickness.

Other athletes of interest include: Adam Sandurski (Pol) who weighed 135 kg and was 214 cm tall. Between 1977 and 1986, he earned 2 silvers and a bronze in the freestyle World Championships, and a bronze in the 1980 Olympics (he did make the 130 kg limit in 1985, placing 4th in the WC); and Chris Taylor (USA) who weighed a huge 196 kg. Taylor won a bronze medal in the 1972 Olympic FS competition.

Mass in open-ended sports (or highest weight classes) provides advantages, especially if the additional mass is fat-free mass. Khosla (1964) cites the 1964 Olympic champions of the Greco-roman, freestyle, and weightlifting in the highest weight division. All champions weighed more than the mean weight of all competitors.

While only one champion from the list exceeded 130 kg, GR Champion, Istvan Kozma (HUN) was 135.5 kg and 202 cm. The average and median values are listed in Table 8.

Table 8. Mean Weight and Height of Olympic and World Champions in Highest Class

Greco-Roman	Weight	Height
mean	120.8	190.3
median	126	191
Freestyle		
mean	116.1	189.2
median	118	190

#### PERFORMANCE EQUITY MODEL

Use of Performance Factors: At what point does a difference in weight make a difference in the competitive outcome?

Table 9. Women’s and Men’s Weight Classes and Spans Between

Women's 10 Weight Classes (kg)	% of bodyweight reduction to next class	Bodyweight reduction to next class (kg)	Men's FS 10 Weight Classes (kg)	% of bodyweight reduction to next class	Bodyweight reduction to next class (kg)
50			57		
53	5.7	3	61	6.6	4
55	3.6	2	65	6.2	4
57	3.5	2	70	7.1	5
59	3.4	2	74	5.4	4
62	4.8	3	79	6.3	5
65	4.6	3	86	8.1	7
68	4.4	3	92	6.5	6
72	5.6	4	97	5.2	5
76	5.3	4	125	22.4	28
Olympic Weights Only			Olympic Weights Only		
50			57		
53	6	8	65	12	8
57	7	12	74	12	12
62	8	14	86	14	14
68	9	14	97	11	14
76	11	31	125	22	31

If one looks at the span from one weight class to the next, it can be expressed in absolute terms (kg), or as a percentage of the preceding weight class. The absolute difference between classes continually increases as one moves from lower to higher weight classes.

What is the role of mass in wrestling? The muscle tissue in the fat-free mass is the source for the generation of force and power to execute holds and overcome the forces and mass of the opponent. What percentage difference creates a competitive advantage? In competitions decided by the narrowest of margins, small differences in strength, power, inertia, and leverage could make difference in the outcome

One focus of attention can be on the relationship between strength and body mass. Studies have shown that the increase in strength as the subject increases in mass is not linear. An increase in size does not allow for the proportional increase in force generation. This suggests that one could employ an approach to the normalization of strength in relation to size. Jaric (2003) in his review of the role of body size in the relation between muscle strength and movement performance, distinguishes between various types of strength and testing modalities, and lists the resulting allometric scaling equations. However, taking the simplest case of strength (S) measured by a dynamometer, the normalized strength (Sn) in relation to body mass (m) is:

$$S_n = S/m^{2/3}$$

A simple examination of the world record clean and jerk in Olympic weightlifting (fig. 3) shows a curvilinear relationship, with the strongest athletes, “pound for pound” at the lowest classes. Some of this relationship may be explained by the fact that in weightlifting as well as wrestling one sees progressively higher percentages of body fat as the classes increase in size.

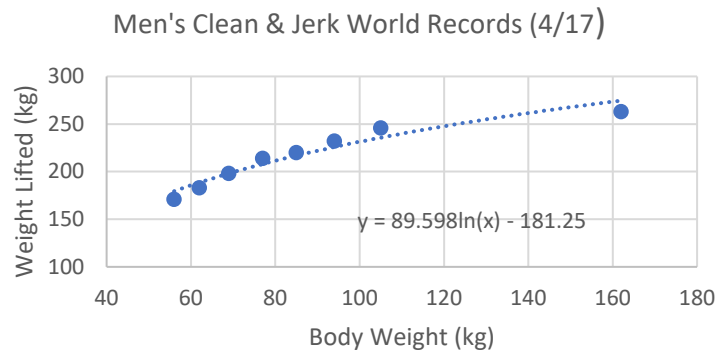


Fig. 6. The Relationship Between Size and Strength in Weightlifting World Records (Clean and Jerk)

Both of these observations can be used in an argument for larger spans between the upper weight classes.

### **Creating a Performance Potential Equity Model**

**Anthropometry and Weight Loss:** The general anthropometric characteristics of wrestlers show a high level of mesomorphy. Studies of elite wrestlers have shown the following somatotypes: 2.4 – 6.7 – 1.5 (Carter et al); Cuban freestyle wrestlers 1.8-6.8-1.4, Greco-roman wrestlers 2.0-6.5-1.5 (Betancourt-Leon et al); and greco-roman competitors from the European Championships 2.7 – 6.2 – 1.7 (Charzewski et al). The brachial index (length of the forearm relative to the upper arm as a %) is low for wrestlers and weightlifters where strength and stability is important. A low brachial index provides the biomechanical advantage of short force arms. Most wrestlers seek to compete in a weight class where their strength (power) to size ratio is maximized. Studies on wrestlers yield low body fat values. In his summary of the characteristics of elite wrestlers, Horswill reports a range of 7.6 – 9.8% body fat. This minimization of body fat-high fits the description of Norton and Olds, as most weight category sports, as one where the competitors use “size optimization.” This classification system of sports is based on the size qualities of the athletes the sport attracts. Additionally, wrestlers will intentionally lose weight to compete at a lower weight class using short-term weight loss methods that can prove to be injurious to health. The American College of Sports Medicine (ACSM), in their position statement on weight loss in wrestlers recommended adding additional weight classes, particularly in the lower and middle classes to reduce the need to use artificial or dangerous means to reach a competitive weight.

The placement of classes must also consider the health impact of wrestlers attempting to move to a lower weight class. Poleva (2008) identified rational boundaries of reduction of body weight - the maximum limits in reduction of body weight, which do not reduce the physical strength of the athlete. This research regarding the advantage gained through weight reduction had a limit of about 9% reduction of body weight. This research supports the notion that an EQUAL DIFFERENCE IN PERCENTAGE OF BODY WEIGHT CAN BE THE MOST EQUITABLE AND FAIREST CHOICE IN THE ESTABLISHMENT OF WEIGHT CLASSES (Lopez-Gonzalez, 2017). Poleva defined the boundaries of a rational reduction of body weight - a maximum reduction limits which does not reduce the physical strength of an athlete. In the weight category up to 42 kg, this figure amounted to 7.6% of body weight; 50 kg - 9.5%; 56 kg - 9.3%; 62 kg - 10.2%; 69 kg - 10.5%; 77 kg - 10.3%; 85 kg - 10.3%; 94 kg - 10.1%; and 105 kg - 9.4%.

Thus, our guiding principles for the development of a weight class structure should be: weight classes must have an equitable impact on athletes along the entire span of classes. Therefore, the distance between classes cannot be a constant, absolute value, but must be based the relative value that accounts for the percentage of the body weight that the span of weight between classes yields. Simply stated, a five kg span between classes has a greater effect on a 65 kg wrestler, compared to a 97 kg wrestler.

The initial decisions to be made must concern the range. This means the establishment of minimum and maximum classes that provide access to wrestling that is as inclusive as possible to the sizes of the entire human population. Valid needs and solutions were often in opposition, but decisions must be made. While population equity is important, performance equity, had to take precedence.

The 10-class structure must be developed to appropriately accommodate the move to 6 weight classes for Olympic years. This necessitated that the 6-weight class structure be established first.

#### **Limitations**

- 1) We do not currently possess anthropometric data for all of the world's population. Additionally, where this data exists, it does not necessarily describe the population of interest, - the potential athletic population. We must infer from expert opinion (coaches and trainers).
- 2) We are bound to create a maximum of 6 classes for Olympic competition. This small number cannot reflect the application of various models and goes counter to suggestions for more weight classes.

#### **Future Work:**

- 1) Identify and use additional population studies (athletic populations) from other continents, particularly Asia.
- 2) While initial hydration measurements are based from a euhydrated state, subsequent making of weight can rely on dehydration. What is needed is technology to make an accurate, quick and non-invasive measure of hydration status that can become a part of the weigh-in process.
- 3) Employment of expert dietician advice is not currently being employed to the necessary degree.

## REFERENCES

- American College of Sports Medicine. Position statement: weight loss in wrestlers. *Med. Sci. Sports* 8:xi-xiii, 1976.
- ACSM Position Stand on Weight Loss in Wrestlers (1996). *Medicine and Science in Sport and Exercise*, 28(2), ix-xii.
- ACSM Expert Consensus Statement on Weight Loss in Weight-Category Sports Current Sports Medicine Reports 20(4):p 199-217, April 2021.
- Artioli G.G., Saunders B., Iglesias R.T., Franchini E. (2016) It is Time to Ban Rapid Weight Loss from Combat Sports. *Sports Med* ;46:1579–1584. doi: 10.1007/s40279-016-0541-x
- Betancourt-Leon, H., Sanchez-Ramirez, G., Martinez-Acosta, M., & Echevarria-Garcia, I. (2002). [Heath-Carter somatotype measurements in elite level Cuban free-style and greco-roman wrestlers.] *Lecturas: educacion fisica y deportes*, 8:45 1-5.
- 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): 14756.
- Carter, J. E. L., Aubrey, S. P., & Sleet, D. A. (1982). Somatotypes of Montreal Olympic athletes. *Medicine and Sport*, 16, 53-60.
- Ceylan, B., et al. (2023). "Changes in body mass and hydration status in judo athletes before and after a top-level competition: a descriptive case study." *Phys Sportsmed* 51(3): 228-233.
- Charzewski, J., Glaz, A., Kuznicki, S. (1991). Somatotype characteristics of elite European wrestlers. *Biology of Sport* 8(4):213-221.
- Curby, D.G. (2012) A Review of the Minimum Wrestling Weight Procedures Used in American Scholastic Wrestling, *International Journal of Wrestling Science*, 2:1, 26-35, DOI:10.1080/21615667.2012.10878941
- Hartmann, B. (2017). personal communication.
- Horswill, C.A. (1994). Physiology and nutrition for wrestling. In D.R. Lamb & H. G. Knuttgen (Eds.). *Perspectives in Exercise Science and Sports Medicine: Physiology and Nutrition for Sport Vol. 7*, (131-179). Carmel, IN: Cooper Publishing.
- Jagim, A. R., et al. (2024). "Collegiate women's wrestling body fat percentage and minimum wrestling weight values: time for revisiting minimal body fat percent?" *J Int Soc Sports Nutr* 21(1): 2304561.
- Jaric, S. (2003). Role of body size in the relation between muscle strength and movement performance. *Exercise and Sport Sciences Reviews.*, 31(1):8-12.
- Mauricio, C. A., et al. (2022). "Rapid Weight Loss of Up to Five Percent of the Body Mass in Less Than 7 Days Does Not Affect Physical Performance in Official Olympic Combat Athletes With Weight Classes: A Systematic Review With Meta-Analysis." *Front Physiol* 13: 830229
- Sayenga, D. (1995). The problem of wrestling 'styles' in the modern Olympic games. *Citius, Altius, Fortius* (became *Journal of Olympic History* in 1997) 3:19-29.
- Khosla, T. (1968). Unfairness of certain events in the Olympic Games. *Brit. Med J.* 4:111-113.
- Khosla, T. (1983). Sport for tall. *Brit. Med. J.* 287:736-738.
- Khosla, T. & McBroom, V.C. (1988). Age, height and weight of female Olympic finalists *Brit. J. Sports Med.* 19:96-99.
- Lopez-Gonzalez, D. (2017). personal communication.
- National Center for Health Statistics, Hyattsville, MD. National Health and Nutrition Examination Survey (NHANES III-1994). <http://www.cdc.gov/nchs/nhanes.html>.
- McArdle WD, Katch KF, VL, Katch. *Exercise physiology: energy, nutrition, and human performance*. 3rd ed. Malvern (PA): Lea & Febiger; 1991.
- Nickhah, F. (1994). personal communication.
- Norton, K. & Olds, T. (1996). Anthropometry and sports performance. In K. Norton, T. Olds, S. Olive., & N. Craig (Eds). *Anthropometrica* (287-352). Sydney: University of New South Wales Press.
- Oppliger, R. A., et al. (2006). "NCAA Rule Change Improves Weight Loss among National Championship Wrestlers." *Med Sci Sports Exerc* 38(5): 963-970.
- Oppliger, RA, Harms, RD, Herrmann, DE, Streich, CM, Clark, RR. The Wisconsin wrestling minimum weight project: a model for weight control among high school wrestlers. *Med Sci Sports Exerc.* 1995; 27(8):1220-1224.
- Pallarés, J., et al. (2016). "Muscle contraction velocity, strength and power output changes following different degrees of hypohydration in competitive olympic combat sports." *Journal of the International Society of Sports Nutrition* 13.
- Poleva, N.V. (2008). One aspect of formation of readiness of wrestlers to compete within the boundaries of their selected weight class. *Bulletin of Tomsk State Pedagogical University. Issue 3 (77)*, 59-63.



- Remick D., Chancellor K., Pederson J., Zambraaki E.J., Sawka M.N., Wenger C.B. Hyperthermia and dehydration-related deaths associated with intentional rapid weight loss in three collegiate wrestlers- North Carolina, Wisconsin, and Michigan, November–December 1997. *J. Am. Med. Assoc.* 1998 doi: 10.1001/jama.279.11.824.
- Slaughter MH, Lohman TG, Boileau RA, et al. Skinfold equations for estimation of body fatness in children and youth. *Hum Biol.* 1988;60(5):709–723.
- Sundgot-Borgen, J., Meyer, N. L., Lohman, T. G., Ackland, T. R., Maughan, R. J., Stewart, A. D., & Müller, W. (2013). How to minimise the health risks to athletes who compete in weight-sensitive sports review and position statement on behalf of the Ad Hoc Research Working Group on Body Composition, Health and Performance, under the auspices of the IOC Medical Commission. *Br J Sports Med*, 47(16), 1012-1022. doi:10.1136/bjsports-2013-092966

# STRUCTURE OF WON MEDALS, MOST SUCCESSFUL TEAMS, AND WRESTLERS BY CONTINENTS AT THE OLYMPIC GAMES 2024

Kristijan Slacanac<sup>1</sup>, Milorad Dokmanac<sup>2</sup>

<sup>1</sup>Ministry of Tourism and Sport, Zagreb, Croatia

<sup>2</sup>College of Higher Vocational Studies "Sports Academy" Belgrade, Serbia

kristijan.slacanac@gmail.com

## ABSTRACT

Given these insights, there is a need for a detailed analysis of the technical and tactical actions of teams and individual wrestlers, including techniques, wrestling positions, time spent, and overall efficiency. This will help determine the true reasons behind the superior performance of Asian wrestlers compared to their European counterparts, particularly in terms of medal wins. This paper defined the structure of medals won by continent, determined the structure of medals won by nation, and identified the best wrestlers by style. Japan, the United States of America, and the Islamic Republic of Iran were the most successful nations. Asian countries won 50% of all medals, while European wrestlers experienced a notable decline in the number of medals (27.77%) and their performance quality. In Greco-Roman wrestling (GR), lower WQ (points per minute), the total number of points scored, and points per match are observed than in Freestyle Wrestling (FS) and Women's Wrestling (WW). This highlights the reduced efficiency and attractiveness of the GR style. Additionally, some nations granted citizenship to foreign wrestlers who subsequently won medals for them in these Olympic Games. The study also pointed out the extremely high efficiency among Japanese female wrestlers, in contrast to the low efficiency (only 16.67%) of European female wrestlers compared to GR and FS. This disparity indicates underdevelopment in women's wrestling in Europe, highlighting areas for further research and improvement. A comprehensive performance analysis of teams and wrestlers is crucial, focusing on techniques, wrestling positions, timing, and overall efficiency. Such analysis could reveal the reasons behind the superior performance of Asian wrestlers compared to their European counterparts and help guide improvements.

**Key Words:** seniors, Greco-Roman, freestyle, woman wrestling, success

## INTRODUCTION

Wrestling, one of the oldest Olympic sports, holds a unique place in this prestigious event, embodying tradition and evolution. The Olympic Games represent the pinnacle of global sports competition, offering athletes from various nations and disciplines the chance to strive for excellence and secure their place in history. The Paris 2024 Olympics continued this legacy by showcasing Greco-Roman wrestling, freestyle, and women's wrestling at the highest level. Analyzing the distribution of medals and assessing team efficiency provides valuable insights into trends, strategies, and competitiveness in Olympic wrestling. Such evaluations highlight the dominance of specific nations, styles, or wrestlers and create a foundation for the further development of wrestling as a sport.

Athletes qualify for the Olympic Games by meeting the criteria of the United World Wrestling (UWW) qualification system (UWW, 2023/2024). The number of wrestlers who can qualify in each weight category is determined through three phases. The first phase refers to World Championships 2023: 60 male wrestlers and 30 female wrestlers (90 athletes) earned quotas. The second phase refers to Continental Qualification Tournaments 2024: 96 male wrestlers and 48 female wrestlers (144 athletes) secured spots. The third phase refers to the World Qualification Tournament 2024: 36 male wrestlers and 18 female wrestlers (54 athletes) qualified. In addition to these quotas, two wrestlers participated under the Refugee Olympic Team (competing under the UWW flag, EOR) through special invitations granted for this event. These allocations ensure representation from diverse backgrounds while adhering to the qualification standards.

The Olympic Games represent the pinnacle of athletic achievement for wrestlers, embodying the dream of competing at the highest level and providing an opportunity to win an Olympic medal. Achieving this goal depends on numerous factors, one of which is competitive efficiency. Research indicates that 87,8% of medalists participated in continental championships and all secured medals before winning the Olympic Games. Furthermore, 82,9% competed at world championships, with 91,2% achieving podium finishes (Latyshev et al., 2020). This underscores

the importance of sustained success at high-level competitions as a key predictor of Olympic triumphs, reflecting both preparation and competitive readiness.

The analysis of competitive efficiency in major wrestling competitions was initiated over 30 years ago by Tünnemann, who analyzed video recordings and introduced the concept of Wrestler Quality (WQ) defined as the number of points scored per minute (Tünnemann, 2004). With the advancement of technology and greater accessibility to video materials, the last decade has witnessed a growth in studies focusing on analyzing competitive efficiency at major wrestling events. Studies in the fields of specific performance, methodologies and applications of WQ, statistical and tactical analyses of wrestlers, efficiency in preparation for and during Olympic competitions, as well as wrestler performance analysis and tactical approaches (Toupchi, Kohandel & Khodayari, 2014; Tünnemann, 2017; Dokmanac & Slačanac, 2018; Latyshev et al., 2020; Starčević, 2023), underscore the evolution of wrestling analytics, blending traditional techniques with modern tools to enhance understanding and application in training and competition strategies.

The International Olympic Committee (IOC) defines successful nations based on the number of gold, silver, and bronze medals won (Olympics, 2024). However, the medal standings do not reveal the distribution of medals by continent, nor do they provide insights into team efficiency (number of wrestlers and medals won) or individual wrestler performance based on match duration, number of wins and losses, points scored, and conceded, and other factors.

This study aimed to evaluate the efficiency of countries, present the distribution of wrestling medals by continent, and identify the most successful wrestlers in Greco-Roman, Freestyle, and Women's Wrestling at the Paris 2024 Olympic Games. By outlining the distribution of medal winners by continent and evaluating both team and individual wrestler performance, this research aims to identify success patterns and offer strategic insights for future Olympic participation. The findings of this study will be valuable to athletes, coaches, sports professionals, and researchers aiming to enhance their understanding of Olympic wrestling.

## **METHODS**

The sample consists of 62 countries, with a subsample of 291 wrestlers (GR=97; FS=98; WW=96) who participated in the 2024 Olympic Games in Paris. Among them, 72 wrestlers are medalists from the 2024 Paris Olympics. Data collection was conducted immediately after the conclusion of the 2024 Olympic Games (August). The data were gathered from the UWW database (Arena - Online Results). To validate the data, calculate efficiency (WQ – wrestlers' quality), determine the distribution of medal winners by continent, and identify the most successful wrestlers, the Python 3.12 programming language (Pandas and NumPy Data Analysis Library) was used. The Microsoft Power BI application was employed for data visualization. Excluding criteria applied during WQ teams' calculation (teams who won medals with three and less than three wrestlers excluded from the calculation).

## **RESULTS**

### **General review (all three styles)**

The highest number of medals at the 2024 Olympic Games in Paris (OG 2024) was won by wrestlers from Japan, the Islamic Republic of Iran, the United States of America, China, Cuba, and Kyrgyzstan (Figure 1). The most efficient nations (based on the number of wrestlers/number of medals won) include Norway, Denmark, Bahrain (one wrestler, one medal), Chile (two wrestlers, one medal), the Democratic People's Republic of Korea, and Albania (three wrestlers, two medals), as well as Japan (13 wrestlers, 11 medals). In contrast, the least efficient nations (based on the number of wrestlers/number of medals won) include Kazakhstan, Turkey, Azerbaijan, and the USA. The nations with the largest contingent of wrestlers who failed to secure a medal at the 2024 Olympic Games in Paris include Egypt, Mongolia, and Algeria. Additionally, countries such as Germany, Hungary, Poland, and Serbia stand out, as their wrestlers did not win medals at these Olympic Games, despite winning medals at the 2023 World Championship, which was one of the qualification tournaments. Of the 62 participating countries at the Paris 2024 Olympics, 26 (41.94%) won medals.

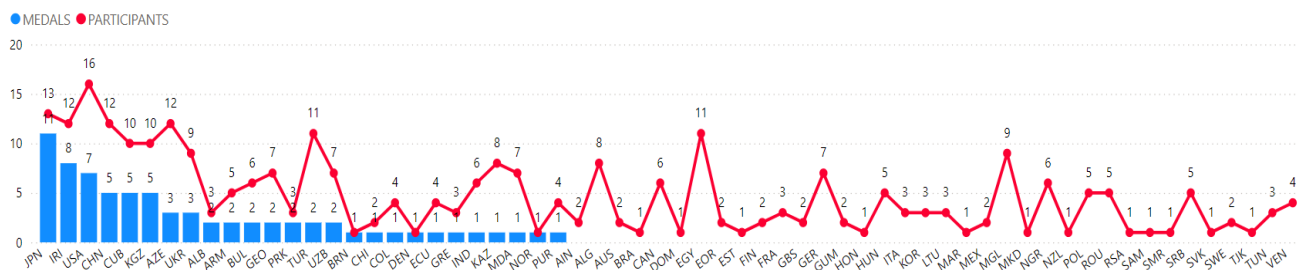


Figure 1 – Number of participants and medals by nations

Japan, the Islamic Republic of Iran, and the United States of America claimed the most medals. Looking at the structure of the medals won, Japan won the most gold medals, followed by Bulgaria, the Islamic Republic of Iran, and the United States of America (Figure 2). The Islamic Republic of Iran, the United States of America, and Ukraine secured the most silver medals, China, Kyrgyzstan, the United States of America, Cuba, and Azerbaijan earned the highest number of bronze medals.

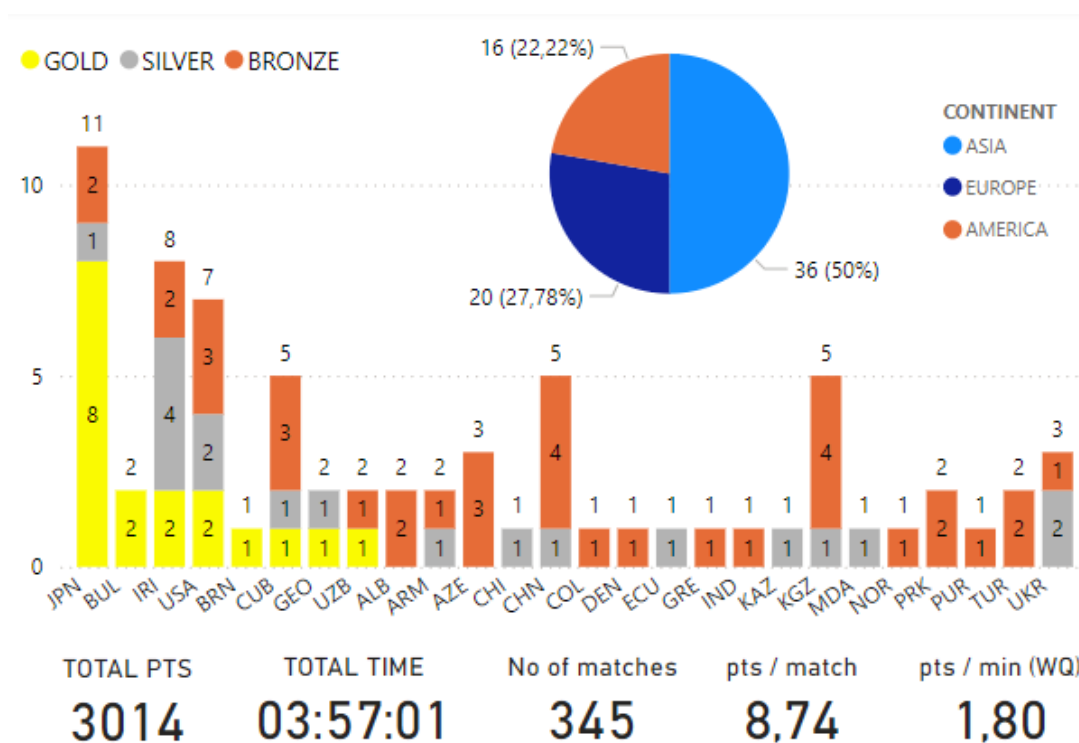


Figure 2 - Structure of medals won by nations

The distribution of medals by continent (Figure 2) shows that 36 medals (50,00%) were won by wrestlers from Asia, 20 medals (27,78%) by wrestlers from Europe, and 16 medals (22,22%) by wrestlers from America. Of the 345 matches in wrestling (all three styles), resulting in 3014 points. The average number of points per match was 8,74 while the efficiency was 1,80 points per minute.

The nations that scored the most points were Japan, the United States of America, and the Islamic Republic of Iran (Table 1), while the nations with the highest lost points were the United States of America, Kyrgyzstan, and Ukraine (Table 2). According to the WQ index, the most successful nations are Norway, Japan, and Bahrain (Table 3).

Table 1. Attack teams' efficiency

Nation	WRES TLERS	TOT_time	WIN bouts	PTS win	WQ WIN (pts/min)
JPN	13	3:16:39	40	318	1,62
USA	16	3:37:55	26	252	1,16
IRI	12	3:17:02	30	241	1,22
CHN	12	2:22:26	16	157	1,10
KGZ	10	3:02:49	22	151	0,83
AZE	12	2:51:42	16	148	0,86
UZB	7	1:52:19	15	136	1,21
UKR	9	2:20:15	13	116	0,83
CUB	10	2:07:20	16	102	0,80
ARM	5	1:25:00	10	86	1,01

Table 2. Defense teams' efficiency

Nation	WRES TLERS	TOT_time	LOST bouts	PTS lost	WQ LOST (pts/min)
USA	16	3:37:55	18	172	0,79
KGZ	10	3:02:49	14	143	0,78
UKR	9	2:20:15	12	138	0,98
CHN	12	2:22:26	13	119	0,84
AZE	12	2:51:42	14	105	0,61
UZB	7	1:52:19	9	98	0,87
IRI	12	3:17:02	12	97	0,49
JPN	13	3:16:39	5	89	0,45
CUB	10	2:07:20	12	84	0,66
MDA	7	0:57:21	8	74	1,29

**LEGEND:** **WRESTLERS** – number of wrestlers; **TOT time** – total time of bouts (all wrestlers), **WIN bouts** – total win bouts, **PTS win**– total win points; **WQ WIN** (win pts/min); **LOST bouts** – total lost bouts, **PTS lost**– total lost points; **WQ lost** (lost pts/min).

Table 3. WQ teams' efficiency

Nation	WQ/min WIN	WQ/min LOST	WQ
NOR	3,80	0,86	2,95
JPN	1,62	0,45	1,16
BRN	1,36	0,47	0,89
PRK	1,74	0,93	0,82
IRI	1,22	0,49	0,73
USA	1,16	0,79	0,37
IND	1,21	0,86	0,35
UZB	1,21	0,87	0,34
GRE	1,11	0,79	0,33
BUL	0,79	0,48	0,31

**LEGEND:** **WQ/min WIN** – totally won points/minute; **WQ/min LOST** – lost points/minute; **WQ** - WQ/min WIN - WQ/min LOST

Gold medal winners (Table 4) have an average of 4 matches, wrestle for 19:53 minutes, and produce 1.23 pts/min. The average attack WQ is 1,52 pts/min, while the average defense WQ is 0.29 pts/min.

The Most Successful Index (MSW) is a value that encompasses several parameters of competitive efficiency, allowing for comparisons and rankings of wrestlers across different weight categories and wrestling styles. MSW is calculated as follows:

**MSW = CP diff** (classification points scored per match – classification points lost per match) – **WQ** (win pts/min – lost pts/min).

The MSW index for gold medal-winning wrestlers at the OG 2024 ranges from 2.88 to 6.63 (Table 2). According to the MSW index, the top three wrestlers are from Japan (Fujinami, Motoki, and Higuchi).

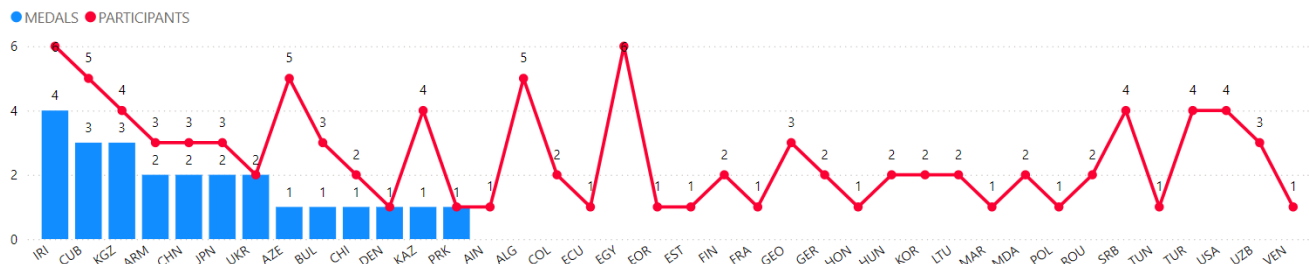
**Table 4. Gold medalists' performance (Most Successful Wrestlers – MSW)**

Style	Nation	Wrestler	Rank	Time	Win	Lost	TP win	TP lost	Win pts /min	Lost pts /min	CP Win	CP Lost	CPwin/ match	CPlost/ match	WQ	CP diff	MSW indeks
WW	JPN	Akari FUJINAMI	1	0:15:02	4	0	34	2	2,26	0,13	18	0	4,50	0,00	2,13	4,50	6,63
WW	JPN	Sakura MOTOKI	1	0:14:08	4	0	34	8	2,41	0,57	18	1	4,50	0,25	1,84	4,25	6,09
FS	JPN	Rei HIGUCHI	1	0:11:37	4	0	26	4	2,24	0,34	16	2	4,00	0,50	1,89	3,50	5,39
WW	USA	Amit ELOR	1	0:19:44	4	0	31	2	1,57	0,10	13	1	3,25	0,25	1,47	3,00	4,47
GR	IRI	Saeid Morad Gholi ESMAEILI LEIVESI	1	0:17:57	4	0	35	9	1,95	0,50	14	2	3,50	0,50	1,45	3,00	4,45
WW	JPN	Tsugumi SAKURAI	1	0:22:08	4	0	33	5	1,49	0,23	14	2	3,50	0,50	1,27	3,00	4,27
GR	IRI	Mohammadhadi Abdollah SARAVI	1	0:21:03	4	0	28	2	1,33	0,10	14	2	3,50	0,50	1,24	3,00	4,24
GR	JPN	Nao KUSAKA	1	0:17:35	4	0	29	5	1,65	0,28	14	3	3,50	0,75	1,36	2,75	4,11
WW	USA	Sarah Ann HILDEBRANDT	1	0:19:44	4	0	25	4	1,27	0,20	13	1	3,25	0,25	1,06	3,00	4,06
GR	JPN	Kenichiro FUMITA	1	0:17:34	4	0	28	5	1,59	0,28	14	3	3,50	0,75	1,31	2,75	4,06
FS	BUL	Magomed Eldarovitch RAMAZANOV	1	0:20:06	4	0	27	7	1,34	0,35	15	3	3,75	0,75	1,00	3,00	4,00
FS	BRN	Akhmed TAZHUDINOV	1	0:19:03	4	0	26	9	1,36	0,47	15	3	3,75	0,75	0,89	3,00	3,89
FS	GEO	Geno PETRIASHVILI	1	0:23:10	4	0	37	11	1,60	0,47	13	2	3,25	0,50	1,12	2,75	3,87
FS	UZB	Razambek Salambekovitch JAMALOV	1	0:26:12	5	0	38	10	1,45	0,38	17	3	3,40	0,60	1,07	2,80	3,87
FS	JPN	Kotaro KIYOOKA	1	0:20:57	4	0	33	10	1,58	0,48	13	3	3,25	0,75	1,10	2,50	3,60
GR	CUB	Mijain LOPEZ NUNEZ	1	0:24:00	4	0	20	2	0,83	0,08	12	2	3,00	0,50	0,75	2,50	3,25
GR	BUL	Semen Sergeevich NOVIKOV	1	0:24:00	4	0	23	5	0,96	0,21	12	3	3,00	0,75	0,75	2,25	3,00
WW	JPN	Yuka KAGAMI	1	0:24:00	4	0	12	3	0,50	0,13	12	2	3,00	0,50	0,38	2,50	2,88

**LEGEND:** **Time** – total time of bouts (all wrestlers), **Win**– total win bouts, **Lost** – total lost bouts, **TP win** – total won points; **TP lost** – total lost points; **CP W** – classification points won per match, **CP L** – classification points lost per match; **WQ** (pts/min won – pts/min lost), **CP diff** - classification points difference (CP Win/match – CP Lost/match), **MSW index** (CP diff - WQ)

**Greco-Roman style (GR)**

The most successful team in GR in terms of the total number of medals is the Islamic Republic of Iran (4 medals), followed by Cuba and Kyrgyzstan (3 medals each). The teams with the largest number of wrestlers who did not win any medals are Egypt, Algeria, Turkey, the USA, and Serbia. Out of a total of 38 nations in the Greco-Roman style, 13 (34,21%) won medals (Figure 3).



**Figure 3 - Number of participants and medals by nations in Greco-Roman style**

The Islamic Republic of Iran and Japan claimed the most gold medals, while Kyrgyzstan and Cuba secured the most bronze medals. Wrestlers from Asia captured 54,17% of the medals, and those from Europe earned 29,17% (Figure 4). In the GR, 115 matches were held, with 834 points earned (7,25 points per match and 1,46 points per minute), and the average match duration was 4:59 minutes.



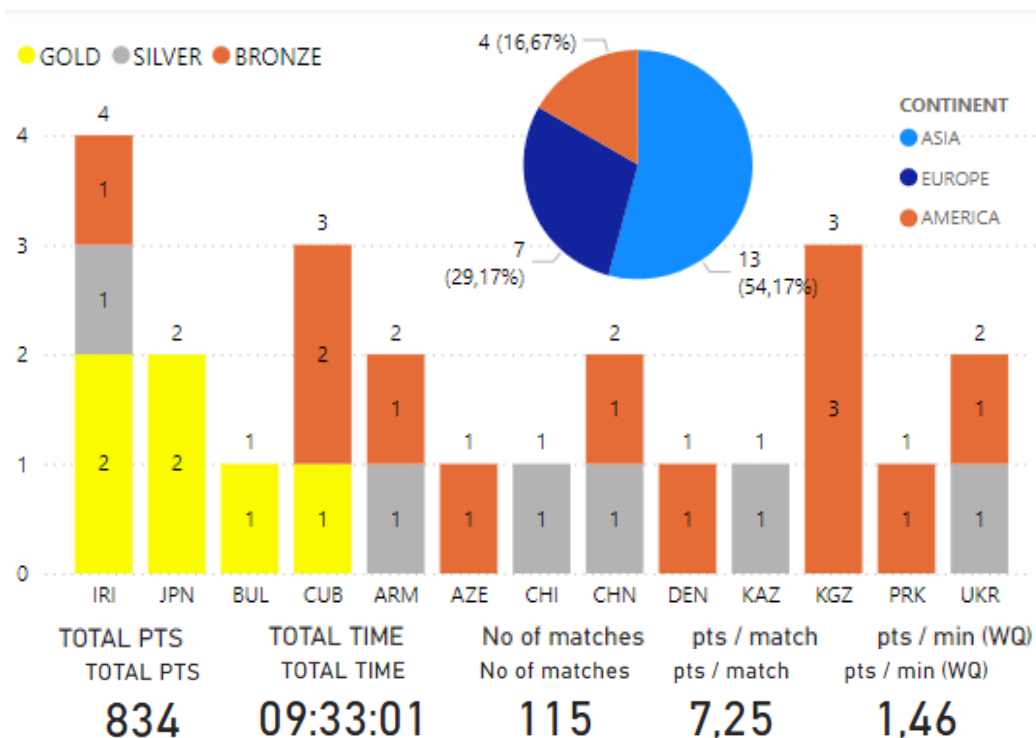


Figure 4 - Structure of medals won by nations in Greco-Roman style

Four gold medalists have a WQ higher than 1,00 (Table 5). One wrestler accumulated over 35 points and recorded the highest number of lost points. Notably, Mijain Lopez Nunez of Cuba, who achieved his fifth Olympic gold medal at these Games, had a WQ of 0,75 pts/min.

Table 5. Greco-Roman style gold medalists' performance (Most Successful Wrestlers – MSW)

Style	Nation	Wrestler	Rank	Time	Win	Lost	TP win	TP lost	Win pts /min	Lost pts /min	CP Win	CP Lost	CPwin/ match	CPlost/ match	WQ	CP diff	MSW indeks
GR	IRI	Saeid Morad Gholi ESMAEILI LEIVESI	1	0:17:57	4	0	35	9	1,95	0,50	14	2	3,50	0,50	1,45	3,00	4,45
GR	IRI	Mohammadhadi Abdollah SARAVI	1	0:21:03	4	0	28	2	1,33	0,10	14	2	3,50	0,50	1,24	3,00	4,24
GR	JPN	Nao KUSAKA	1	0:17:35	4	0	29	5	1,65	0,28	14	3	3,50	0,75	1,36	2,75	4,11
GR	JPN	Kenichiro FUMITA	1	0:17:34	4	0	28	5	1,59	0,28	14	3	3,50	0,75	1,31	2,75	4,06
GR	CUB	Mijain LOPEZ NUNEZ	1	0:24:00	4	0	20	2	0,83	0,08	12	2	3,00	0,50	0,75	2,50	3,25
GR	BUL	Semen Sergeevich NOVIKOV	1	0:24:00	4	0	23	5	0,96	0,21	12	3	3,00	0,75	0,75	2,25	3,00

**LEGEND:** Time – total time of bouts (all wrestlers), Win– total win bouts, Lost – total lost bouts, TP win – total won points; TP lost – total lost points; CP W – classification points won per match, CP L – classification points lost per match; WQ (pts/min won – pts/min lost), CP diff - classification points difference (CP Win/match – CP Lost/match), MSW index (CP diff - WQ)

### Freestyle (FS)

The most successful team in Freestyle (FS) wrestling at the OG 2024 is the Islamic Republic of Iran with four medals won. The teams with the highest number of wrestlers who did not win any medals are China, Egypt, and Kazakhstan. Of the 43 nations participating in the FS style, 13 (30,23%) earned medals (Figure 5).

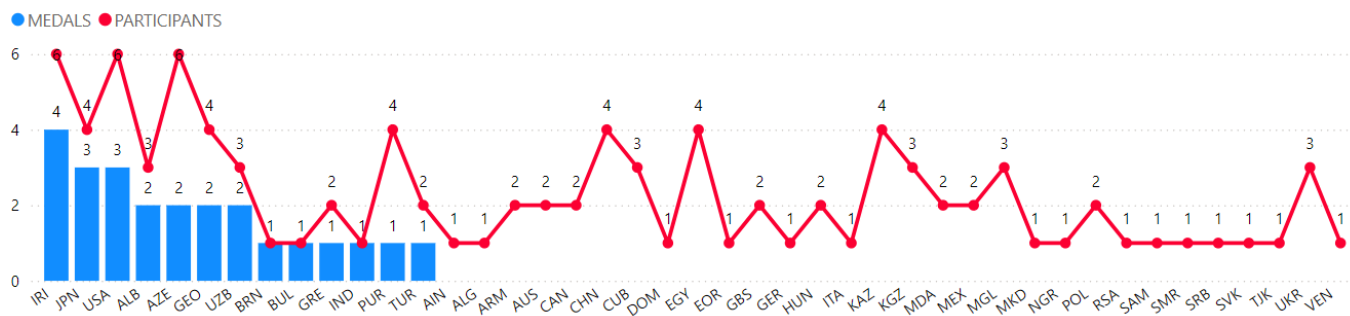


Figure 5 - Number of participants and medals by nations in Freestyle

Japan won the most FS gold medals at the OG 2024, while wrestlers from Japan claimed the most silver medals (Figure 6). A significant portion of the medals, 45,83%, was earned by Asian wrestlers, while 37,50% came from European competitors. The FS wrestling event featured 117 matches, with 1183 points scored (an average of 10,11 points per match and 2,09 points per minute). The average match duration was 4:51 minutes.

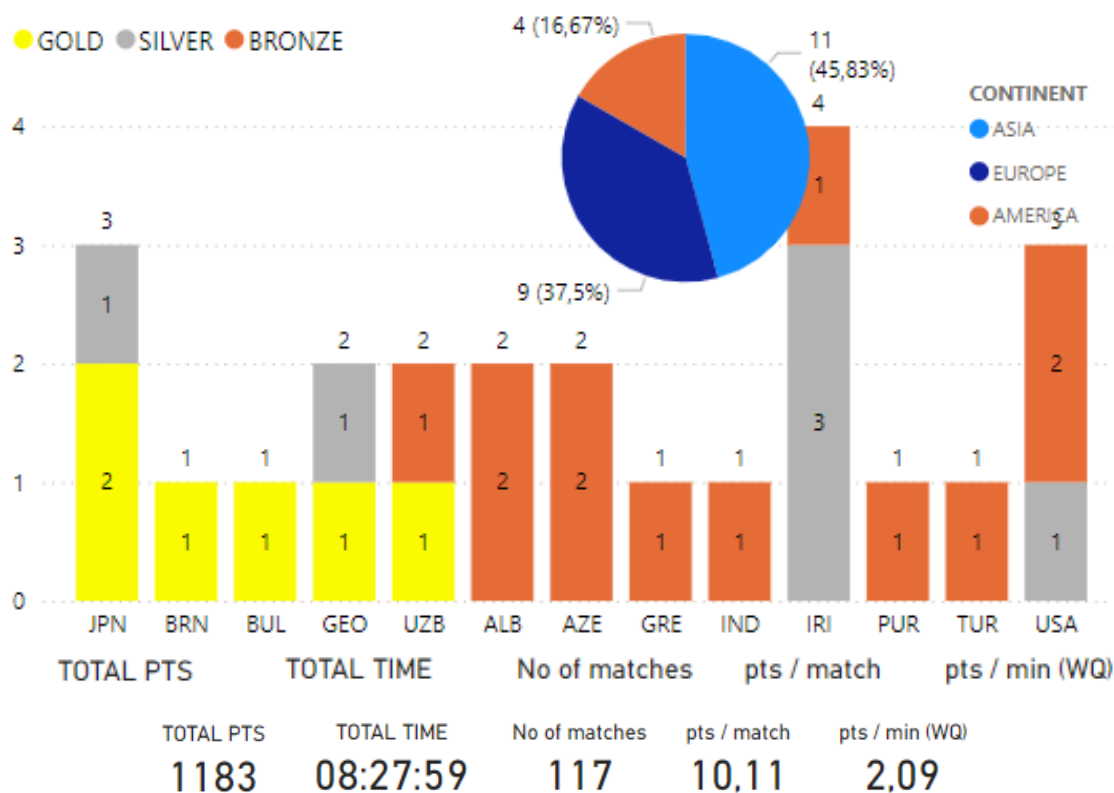


Figure 6 - Structure of medals won by nations in Freestyle

Two wrestlers in FS at the OG 2024 scored more than 35 points (Table 6), while three wrestlers lost fewer than 10 points. The WQ index for FS wrestlers ranged from 0,89 to 1,89. Among all the gold medalists, Higuchi Reil from Japan stands out for his exceptional efficiency, with a WQ of 1,89 pts/min, significantly higher than the others. This indicates his superior performance in terms of points per minute compared to other medalists.

Table 6. Freestyle gold medallists' performance (Most Successful Wrestlers – MSW)

Style	Nation	Wrestler	Rank	Time	Win	Lost	TP win	TP lost	Win pts /min	Lost pts /min	CP Win	CP Lost	CPwin/ match	CPlost/ match	WQ	CP diff	MSW indeks
FS	JPN	Rei HIGUCHI	1	0:11:37	4	0	26	4	2,24	0,34	16	2	4,00	0,50	1,89	3,50	5,39
FS	BUL	Magomed Eldarovitch RAMAZANOV	1	0:20:06	4	0	27	7	1,34	0,35	15	3	3,75	0,75	1,00	3,00	4,00
FS	BRN	Akhmed TAZHUDINOV	1	0:19:03	4	0	26	9	1,36	0,47	15	3	3,75	0,75	0,89	3,00	3,89
FS	GEO	Geno PETRIASHVILI	1	0:23:10	4	0	37	11	1,60	0,47	13	2	3,25	0,50	1,12	2,75	3,87
FS	UZB	Razambek Salambekovitch JAMALOV	1	0:26:12	5	0	38	10	1,45	0,38	17	3	3,40	0,60	1,07	2,80	3,87
FS	JPN	Kotaro KIVOOKA	1	0:20:57	4	0	33	10	1,58	0,48	13	3	3,25	0,75	1,10	2,50	3,60

**LEGEND:** Time – total time of bouts (all wrestlers), **Win**– total win bouts, **Lost** – total lost bouts, **TP win** – total won points; **TP lost** – total lost points; **CP W** – classification points won per match, **CP L** – classification points lost per match; **WQ** (pts/min won – pts/min lost), **CP diff** - classification points difference (CP Win/match – CP Lost/match), **MSW index** (CP diff - WQ)

**Woman Wrestling (WW)**

The most successful team in terms of total medals won in WW is Japan, with six medals, followed by the United States of America with four, and China with three medals won. The teams with the most wrestlers who did not win any medals include Mongolia, India, and Nigeria. Of the 36 nations competing in women's wrestling, 12 (33,33%) won medals (Figure 7).

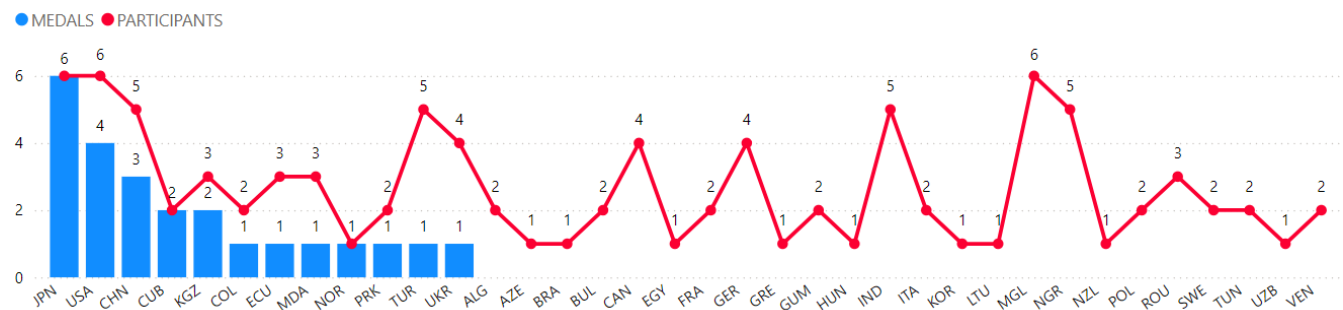


Figure 7 - Number of participants and medals by nations in Woman wrestling

Japan won the most gold medals, while wrestlers from China claimed the highest number of bronze medals. Wrestlers from Asia secured 50,00% of the total medals, while wrestlers from America won 33,33%, and European wrestlers earned only 16.67% of the medals (Figure 8). In women's wrestling, 113 matches took place, with 997 points scored (8,82 points per match and 1,86 points per minute), and the average match duration was 4:42 minutes.

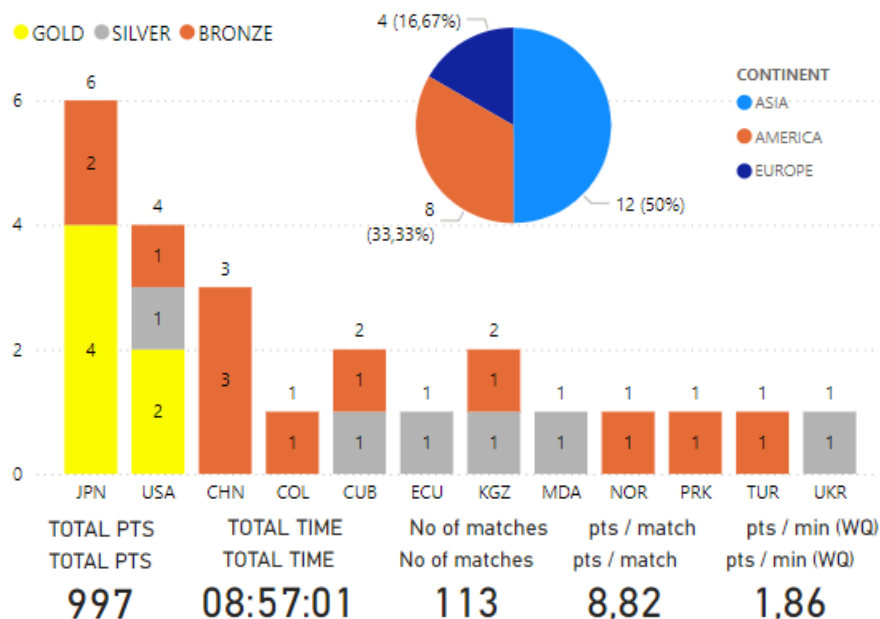


Figure 8 - Structure of medals won by nations in Woman wrestling

Four wrestlers scored over 30 points (Table 7). The gold medallists lost between 2 to 8 points. The wrestler with the best point differential (32 points) was Fujinami Akari. The WQ index values range from 0,38 to 2,13. By all efficiency indicators, the standout wrestler is Fujinami Akari (Japan), whose point differential is 32 points and whose WQ is 2,13.

Table 7. Women wrestling gold medallist's performance (Most Successful Wrestlers – MSW)

Style	Nation	Wrestler	Rank	Time	Win	Lost	TP win	TP lost	Win pts /min	Lost pts /min	CP Win	CP Lost	CPwin/ match	CPlost/ match	WQ	CP diff	MSW indeks
WW	JPN	Akari FUJINAMI	1	0:15:02	4	0	34	2	2,26	0,13	18	0	4,50	0,00	2,13	4,50	6,63
WW	JPN	Sakura MOTOKI	1	0:14:08	4	0	34	8	2,41	0,57	18	1	4,50	0,25	1,84	4,25	6,09
WW	USA	Amit ELOR	1	0:19:44	4	0	31	2	1,57	0,10	13	1	3,25	0,25	1,47	3,00	4,47
WW	JPN	Tsugumi SAKURAI	1	0:22:08	4	0	33	5	1,49	0,23	14	2	3,50	0,50	1,27	3,00	4,27
WW	USA	Sarah Ann HILDEBRANDT	1	0:19:44	4	0	25	4	1,27	0,20	13	1	3,25	0,25	1,06	3,00	4,06
WW	JPN	Yuka KAGAMI	1	0:24:00	4	0	12	3	0,50	0,13	12	2	3,00	0,50	0,38	2,50	2,88

**LEGEND:** **Time** – total time of bouts (all wrestlers), **Win**– total win bouts, **Lost** – total lost bouts, **TP win** – total won points; **TP lost** – total lost points; **CP W** – classification points won per match, **CP L** – classification points lost per match; **WQ** (pts/min won – pts/min lost), **CP diff** - classification points difference (CP Win/match – CP Lost/match), **MSW index** (CP diff - WQ)

## DISCUSSION

Comparing the data from the previous 2020 Olympic Games (OG 2020), wrestlers from Europe (OG 2020: 35 medals; OG 2024: 20 medals) and Africa (OG 2020: 2 medals; OG 2024: 0 medals) won significantly fewer medals in OG 2024. Meanwhile, Asian wrestlers made notable progress, securing 50% of all medals in OG 2024 (OG 2020: 23 medals; OG 2024: 36 medals). Six European teams that won 9 medals at OG 2020 did not secure any medals at OG 2024. A key reason for the decline in European medals is the absence of Russian and Belarusian wrestlers, who participated in OG 2020 with 24 athletes and won 10 medals. Wrestlers who had won medals at the 2023 World Championships but failed to secure any at OG 2024 include athletes from Hungary, Serbia, Germany, and Poland. In contrast, Japan (OG 2020: 7 medals; OG 2024: 11 medals) and the Islamic Republic of Iran (OG 2020: 4 medals; OG 2024: 8 medals) showed substantial improvement compared to the previous Olympic Games. Both countries were among the most successful, with Japan achieving 11 medals from 13 wrestlers and Iran winning 8 medals from 12 wrestlers. Factors such as facilities, physiological aspects, management, and psychological elements played a key role in the success of the Iranian Greco-Roman wrestling team at the 2012 Olympic Games in London (Toupchi et al., 2014).

The results indicate that the Greco-Roman (GR) style at the OG 2024 has a lower WQ value (1.46 pts/min), as well as fewer points and points per match compared to Freestyle (FS) (2,09 pts/min) and Women's Wrestling (WW) (1,86 pts/min). However, these efficiency indicators for GR suggest a more detailed analysis of techniques and rule modifications to enhance the attractiveness of the Greco-Roman style. In all three styles, WQ values at OG 2024 have increased (GR = 1,46; FS = 2,09; WW = 1,86) compared to OG 2020 (GR = 1,32; FS = 1,72; WW = 1,84), which aligns with previous research (Tünnemann, 2017; Dokmanac & Slačanac, 2018; Starčević, 2023). The increase in efficiency and WQ values across all three wrestling styles may be attributed to improved conditioning, mental preparation, and technical-tactical training of Asian wrestlers. Further, in-depth research into the technical and tactical approaches is essential to identify the factors contributing to their enhanced efficiency at the Olympic Games.

For the first time in Olympic history, Asian wrestlers won more medals than those from Europe in the Greco-Roman (GR) style. This is also supported by the fact that only 20 medallists (27.7%) came from Europe. Greco-Roman wrestlers earned 883 technical points, significantly fewer compared to the Freestyle (FS) (1,183 points) and Women's Wrestling (WW) (997 points) categories. Furthermore, only seven GR medallists achieved a WQ (win points per minute) of 1.00 pts/min, of which four were gold medallists. The lower efficiency may be attributed to the absence of Russian and Belarusian wrestlers, whose performance at the OG 2020 was significantly high. The small number of points earned in GR may be due to the rule of technical superiority, which is set at 8 8-point difference in GR, whereas FS and WW require a 10-point difference. Therefore, WQ (pts/min) is a more accurate and realistic efficiency indicator. All of this highlights the lower performance of GR wrestlers and the need for a detailed analysis of competitive efficiency to improve both the effectiveness and attractiveness of the Greco-Roman style.

The competition in freestyle (FS) wrestling has been significantly enhanced by wrestlers of Russian and Belarusian nationality competing for other countries such as Hungary, Greece, Slovakia, and Serbia. This has contributed to Bahrain winning a gold medal and Albania securing two bronze medals. Furthermore, European wrestlers claimed

37,5% of the FS medals, outperforming those in Greco-Roman (GR) and women's wrestling (WW). This increase in performance compared to the 2020 Olympics can be seen in the rise of technical points scored (OG 2020: 1046; OG 2024: 1183), the improvement in the WQ value (OG 2020: 1,72; OG 2024: 2,09), and points per match (OG 2020: 9,18; OG 2024: 10,11). Japan, the Islamic Republic of Iran, and the United States claimed 10 medals, almost 30% of all FS medals, reflecting the strong tradition and dedicated training in freestyle wrestling in these countries. Japan has been a dominant force in women's wrestling since 1989 when they won their first team world championship. Japan has had a world champion at every world championship since 1989 and has won the team championship 19 times. They have won 136 world championship medals (Curby & Jomand, 2015). In the context of the 2024 Olympics, Japan's wrestlers have secured 25% of all WW medals, with an outstanding 100% efficiency rate—6 wrestlers won 4 gold and 2 bronze medals. This impressive performance can be attributed to Japan's long-standing women's wrestling tradition, exceptional technical and physical preparation, and strong discipline. On the contrary, European female wrestlers showed much lower efficiency compared with (GR) and freestyle (FS) wrestling, with only 16,67% of medals being claimed by them. This indicates the need for further development in women's wrestling within Europe, highlighting areas for future research and progress.

## CONCLUSIONS

This study defines the structure of medal wins by continent, outlines the medal distribution by nation, and identifies the top wrestlers by style. It also analyses the competitive efficiency of nations and athletes, highlighting specific weaknesses in terms of performance.

The findings show that Asian nations claimed 50% of all medals, while European wrestlers showed a decline in the medals number and the quality of their performances. Although there was an increase in efficiency compared to the previous Olympic Games, the performance of Greco-Roman wrestlers remains low. Additionally, a noticeable trend is the rise in wrestlers who, after changing nationality, won medals for other nations. Japan's dominance in women's wrestling (WW) is confirmed, with all of their wrestlers securing medals, showcasing a 100% efficiency rate.

## REFERENCES

- Arena. (n.d.). UWW Arena. United World Wrestling. Retrieved from <https://arena.uww.org/>
- Dokmanac, M., & Slaćanac, K. (2018). Analysis of the most important parameters in wrestling matches from the Senior World Championship 2017, the Senior European Championship 2018, and the World Championship 2018. *International Journal of Wrestling Science*, 8(2), 18-29.
- Latyshev, M., Latyshev, S., Korobeynikov, G., Kvasnytsya, O., Shandrygos, V., & Dutchak, Y. (2020). The analysis of the results of the Olympic freestyle wrestling champions. *Journal of Human Sport and Exercise*, 15(2), 400-410. <https://doi.org/10.14198/jhse.2020.152.14>
- Toupchi, M. R., Kohandel, M., & Khodayari, A. (2014). The evaluation of factors affecting the success of the Iranian wrestling team in the 2012 London Olympic Games (perspectives of professionals and athletes). *International Journal of Academic Research in Business and Social Sciences*, 4(2), 1-6.
- Olympics (2024). Wrestling Medal Count - Paris 2024 Olympic Medal Table. Olympics. Retrieved from <https://olympics.com/en/olympic-games/paris-2024/medals>
- Performance Data Analysis (PDA). (n.d.). Retrieved from <https://app.powerbi.com/view?r=eyJrIjoiMTNmMTVkMWItY2ZkOC00MTg2LWFMmNjAtNTk4MzI0MTM4NzcxliwidCI6IjU0MGJlYjgzLTY0MDctNDk3OS1iZWExLTdmODU0OTViMTI1MSIsImMiOiJ9>
- Starčević, N. (2023). Correlation of the beginning technical and tactical elements in top-level classical-style wrestlers at the Olympic Games (Doctoral thesis). Faculty of Kinesiology, University of Zagreb, Croatia.
- Tünemann, H. (2017). Technical-tactical combat behavior in the wrestling finals of the 2016 Olympic Games Rio in comparison to the 2012 Olympic Games London. In *Proceedings of the book: Applicable research in wrestling* (pp. 145-153). Novi Sad: Faculty of Sport and Physical Education, University of Novi Sad; Faculty of Kinesiology, University of Zagreb.
- United World Wrestling (UWW). (2023). Qualifying system – Games of the XXXIII Olympiad Paris 2024. Retrieved from [https://cdn.uww.org/2023-12/231206\\_qualification\\_system\\_paris2024\\_english.pdf](https://cdn.uww.org/2023-12/231206_qualification_system_paris2024_english.pdf)

# ANALYSIS OF THE OLYMPIC GAMES – PARIS 2024 - GR-FS-WW

Milorad Dokmanac

College of Higher Vocational Studies “Sports Academy” Belgrade, Serbia

dokns1@yahoo.com

## OVERVIEW OF THE MEDALS WON AT THE OLYMPIC GAMES

### TOTAL NUMBER OF MEDALS SEPARATELY BY EACH STYLE AND NATIONAL TEAMS

#### GRECO ROMAN STYLE (GR)

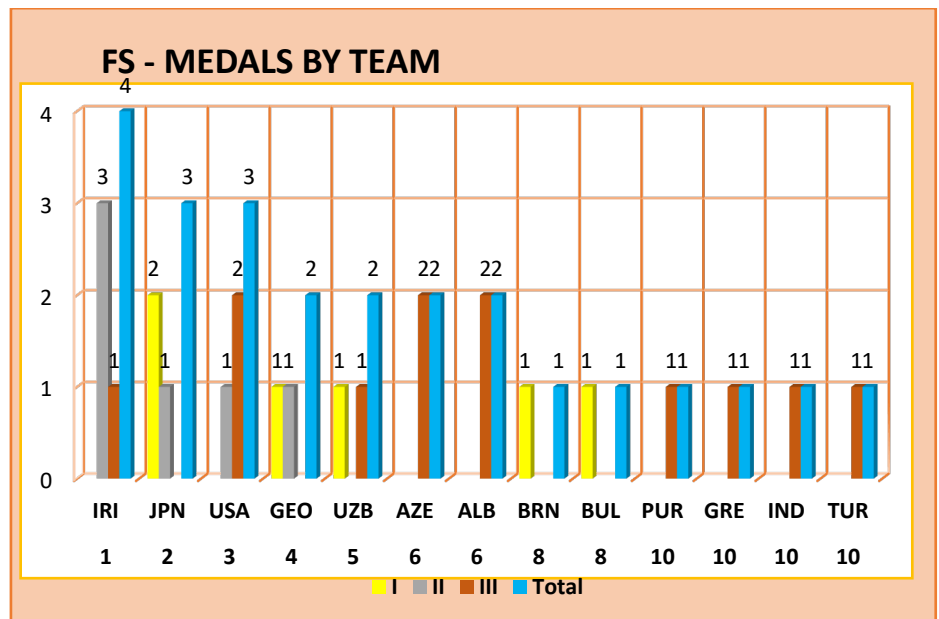
A total of 13 national teams won medals in GR style at the Olympics. Greater success in GR style was achieved by three national teams: IRI, CUB and KGZ. National teams from Asia are dominant in the number of medals won. In total, 6 nations from Asia won medals, while 5 national teams from Europe won medals. Olympic champions are held by 4 nations: IRI (2), JPN (2), CUB (1) and BUL (1).

#### FREE STYLE (FS)

A total of 13 national teams won FS style medals at the Olympics. Great success in GR style was achieved by three national teams: IRI, JPN and USA. In total, 6 national teams from Europe won Olympic medals, while 5 national teams from Asia won medals. However, according to the number of medals, the national teams from Asia won two more medals. Olympic champions are held by 5 nations: JPN (2), UZB (1), GEO (1), BRN (1) and BUL (1). Only the Japanese national team had two Olympic winners in the FS. Iran had three finals, but they lost all three matches and won 3 silver medals.

Sn	NAT	I	II	III	Tot.
1.	IRI		3	1	4
2.	JPN	2	1		3
3.	USA		1	2	3
4.	UZB	1		1	2
5.	GEO	1	1		2
6.	AZE			2	2
7.	ALB			2	2
8.	BRN	1			1
9.	BUL	1			1
10.	PUR			1	1
11.	GRE			1	1
12.	IND			1	1
13.	TUR			1	1
<b>Total =</b>		<b>6</b>	<b>6</b>	<b>12</b>	<b>24</b>

yellow - Asia  
green - Europe  
blue - America



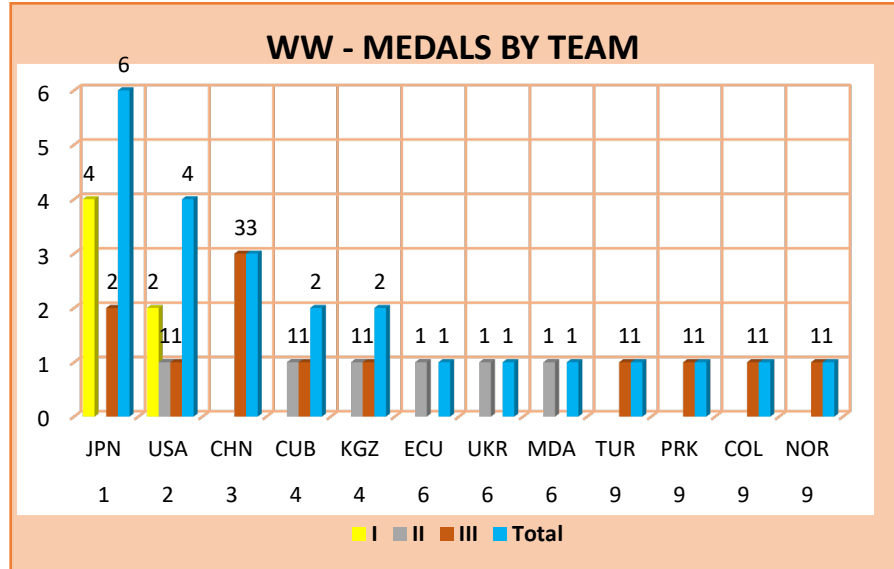


### WOMEN WRESTLING (WW)

A total of 12 national teams won WW-style medals at the Olympics. Three national teams achieved greater success in WW: JPN, USA and CHN with 3 and 4 medals. It is interesting to note that 4 national teams from Asia, Europe and America won medals. Great progress was made by the national teams from America where 4 teams won medals. Only two nations have Olympic champions: JPN (4) and USA (2). The national team of Japan, whose women won 4 titles of Olympic champions, stands out. The other two golds were won by the USA.

Sn	NAT	I	II	III	Total
1.	JPN	4		2	6
2.	USA	2	1	1	4
3.	KGZ		1	1	2
4.	CHN			3	3
5.	ECU		1		1
6.	CUB		1	1	2
7.	UKR		1		1
8.	TUR			1	1
9.	PRK			1	1
9.	MDA		1		1
9.	COL			1	1
9.	NOR			1	1
<b>Total =</b>		<b>6</b>	<b>6</b>	<b>12</b>	<b>24</b>

yellow - Asia  
green - Europe  
blue - America



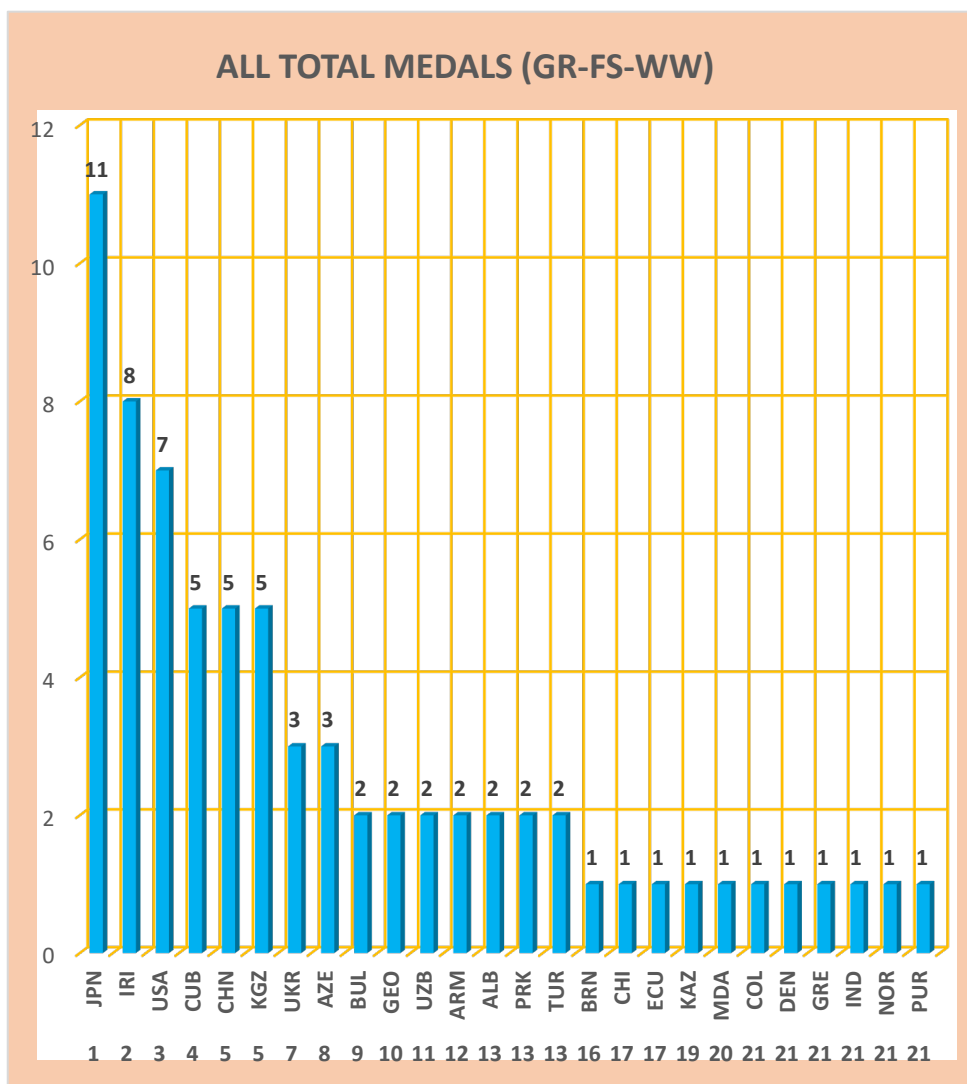
### TOTAL NUMBER OF MEDALS TOGETHER IN ALL THREE STYLES BY NATIONAL TEAMS

By far the most successful national team at the Olympics was Japan with 11 medals won in 3 styles. There is especially great dominance in the number of gold medals because they won a total of 8, while IRI, USA and BUL won two medals each. The largest number of silver medals was won by Iran (4), and the most bronze medals by CHN and KAGZ (3).

In total, 26 national teams won medals at these Olympic Games. 11 national teams won medals from Europe, 9 national teams from Asia and 6 national teams from America won medals. There is not a single team from Europe in the first 6 teams by number of medals, when looking at the total number of medals won.

.	NAT	I	II	III	
1	JPN	8	1	2	11
2	IRI	2	4	2	8
3	USA	2	2	3	7
4	CUB	1	1	3	5
5	CHN		1	4	5
5	KGZ		1	4	5
7	UKR		2	1	3
8	AZE			3	3
9	BUL	2			2
1	GEO	1	1		2
1	UZB	1		1	2
1	ARM		1	1	2
1	ALB			2	2
1	PRK			2	2
1	TUR			2	2
1	BRN	1			1
1	CHI		1		1
1	ECU		1		1
1	KAZ		1		1
2	MDA		1		1
2	COL			1	1
2	DEN			1	1
2	GRE			1	1
2	IND			1	1
2	NOR			1	1
2	PUR			1	1
<b>Total =</b>		<b>18</b>	<b>18</b>	<b>36</b>	<b>72</b>

yellow - Asia  
green - Europe  
blue - America



### TOTAL NUMBER OF MEDALS (I-II-III) TOGETHER IN ALL THREE STYLES BY NATIONAL TEAMS

Only the Japanese national team has won medals in all three Olympic wrestling styles - GR-FS-WW. They have won medals in two Olympic styles: IRI, USA, CUB, CHN, KGZ, UKR, AZE, BUL, PRK, TUR.

A total of 15 and more nations have won 2 or more medals, and 11 nations have won one medal, Bahrain one gold, CHI, ECU, KAZ, MDA one silver, COL, DEN, GRE, IND, NOR, PUR one bronze.

Rk	NAT	GR				FS				WW				TOTAL			
		I	II	III	TOT	I	II	III	TOT	I	II	III	TOT	I	II	III	TOT
1	JPN	2			2	2	1		3	4		2	6	8	1	2	11
2	IRI	2	1	1	4		3	1	4					2	4	2	8
3	USA						1	2	3	2	1	1	4	2	2	3	7
4	CUB	1		2	3						1	1	2	1	1	3	5
5	CHN		1	1	2							3	3	0	1	4	5
5	KGZ			3	3						1	1	2	0	1	4	5
7	UKR		1	1	2						1		1	0	2	1	3
8	AZE			1	1			2	2					0	0	3	3
9	BUL	1			1	1			1					2	0	0	2
10	GEO					1	1		2					1	1	0	2
11	UZB					1		1	2					1	0	1	2
12	ARM		1	1	2									0	1	1	2
13	ALB							2	2					0	0	2	2
13	PRK			1	1							1	1	0	0	2	2
13	TUR							1	1			1	1	0	0	2	2
16	BRN					1			1					1	0	0	1
17	CHI		1	0	1									0	1	0	1
17	ECU										1		1	0	1	0	1
17	KAZ		1		1									0	1	0	1
17	MDA										1		1	0	1	0	1
21	COL											1	1	0	0	1	1
21	DEN			1	1									0	0	1	1
21	GRE							1	1					0	0	1	1
21	IND							1	1					0	0	1	1
21	NOR											1	1	0	0	1	1
21	PUR							1	1					0	0	1	1
TOTAL =		6	6	12	24	6	6	12	24	6	6	12	24	18	18	36	72

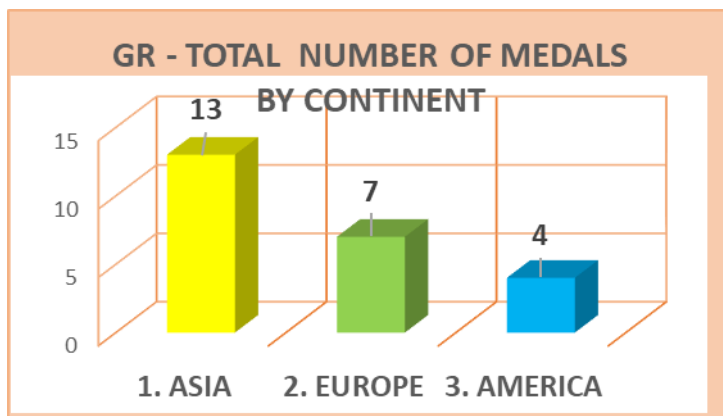
## TOTAL NUMBER OF MEDALS BY WRESTLING STYLE AND CONTINENTS

### GRECO ROMAN STYLE (GR)

For the first time in Olympic history, wrestlers from Asia won more medals than wrestlers from Europe in the GR style. This difference is very big - 6 medals.

A significant number of medals were also won by wrestlers from the American continent in the GR style. The other two continents, Africa and Oceania, did not win a single medal in the GR style at these Olympic Games.

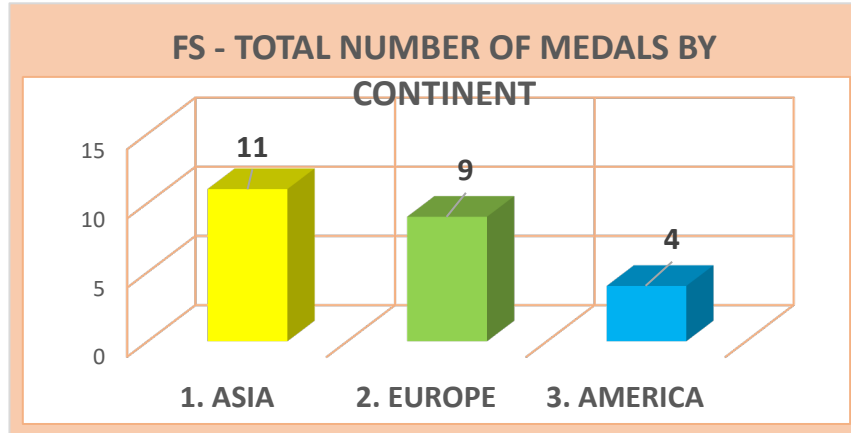
	CONTINENT	Num.	%
1.	ASIA	13	54%
2.	EUROPE	7	29%
3.	AMERICA	4	17%
Total =		24	100%%



### FREESTYLE (FS)

Just as the most successful wrestlers from Asia were in GR style, so in freestyle Asia is ahead of Europe. This difference in the number of medals is slightly smaller 11-9 in favor of Asia. National teams from Europe have won more medals in FS than in GR style primarily because a significant number of wrestlers from Dagestan and Chechnya wrestle for national teams from Europe. A significant number of medals were also won by wrestlers from the American continent in the FS style (4). The other two continents, Africa and Oceania, did not win a single medal in the FS style at these Olympic Games.

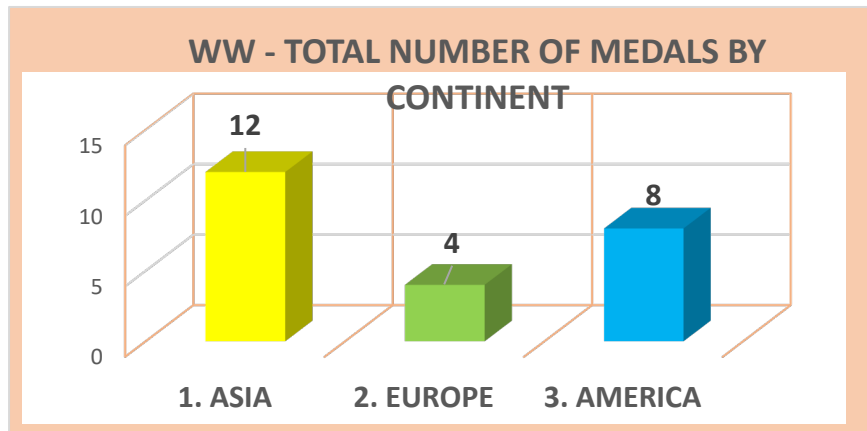
	CONTINENT	Num.	%
1.	ASIA	11	46%
2.	EUROPE	9	37%
3.	AMERICA	4	17%
Total =		24	100%



### WOMEN WRESTLING (WW)

In all three wrestling styles, wrestlers from Asia won the most medals. When it comes to WW, this is no surprise because for many years the leading wrestling nations in WW have been Asian countries. (JPN, CHN, MGL, IND). A significant number of medals were also won by wrestlers from the American continent in WW (8), while the number of medals from European national teams is very small and modest compared to previous competitions. National teams of Europe won only 4 medals in WW. The other two continents, Africa and Oceania, did not win a single medal in the FS style at these Olympic Games.

	CONTINENT	Num. med.	%
1.	ASIA	12	50%
2.	EUROPE	4	17%
3.	AMERICA	8	33%
Total =		24	100%

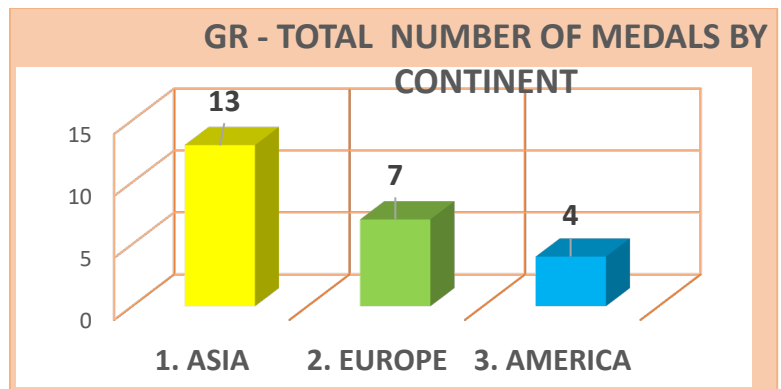


### TOTAL NUMBER OF MEDALS (I-II-III) SEPARATELY BY EACH STYLE AND CONTINENTS

#### GRECO ROMAN STYLE (GR)

Out of 6 titles of Olympic champions, as many as 4 were won by wrestlers from Asia, while one title each went to wrestlers from Europe and America. Asian wrestlers won 67% of gold medals and 50% of silver and 50% of bronze medals in GR style

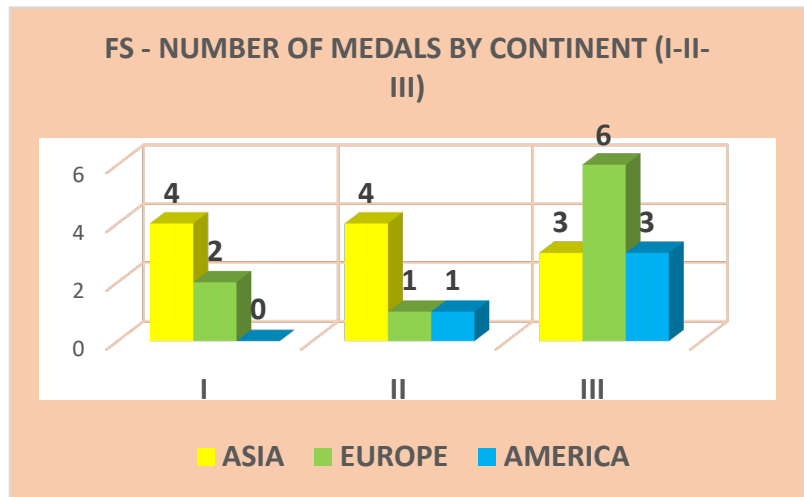
		I	II	III	Total
1	ASIA	4	3	6	13
2	EUROPE	1	2	4	7
3	AMERICA	1	1	2	4
		6	6	1	24



### FREE STYLE (FS)

Out of 6 titles of Olympic champions, as many as 4 were won by wrestlers from Asia, while two titles went to wrestlers from Europe. The big surprise is that the USA team did not win a single gold medal. Asian wrestlers won 67% of gold medals and 67% of silver medals in GR style. Europe has a significant number of bronze medals 50% (6).

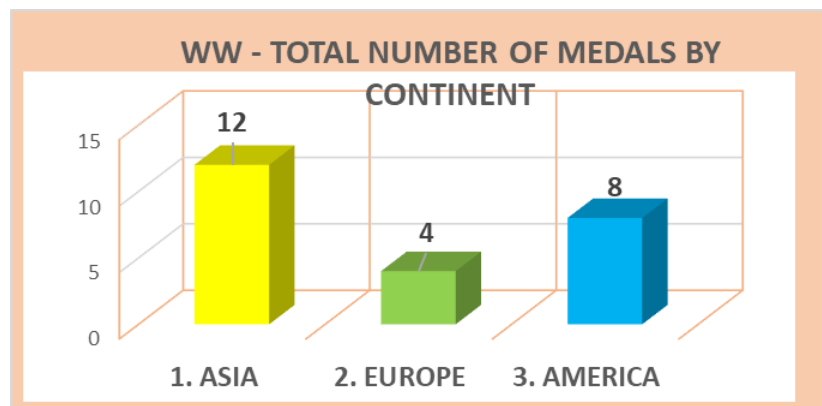
		I	II	III	Total
1	ASIA	4	4	3	11
2	EUROPE	2	1	6	9
3	AMERICA	0	1	3	4
		6	6	12	24



### WOMEN WRESTLING (WW)

Out of 6 titles of Olympic champions, as many as 4 were won by female wrestlers from Asia, while two championship titles were won by female wrestlers from the USA. Female wrestlers from Europe did not win a single gold medal. Asian female wrestlers won 67% of gold medals (4) and 58% of bronze medals (7) in WW style.

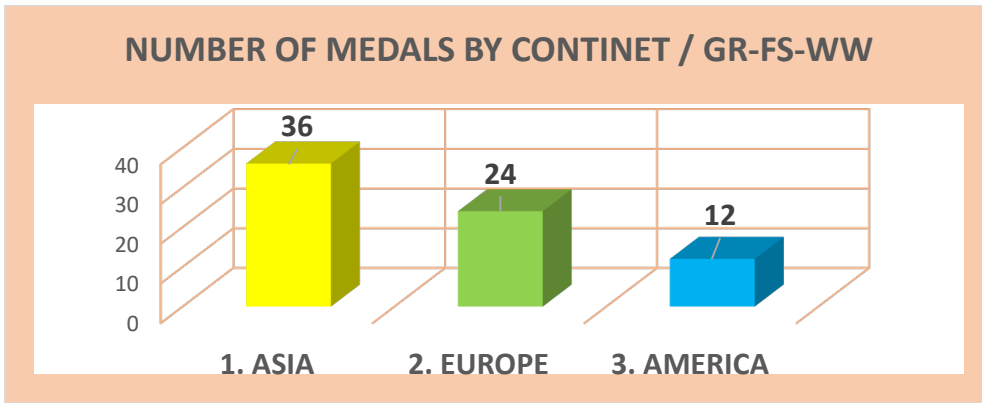
		I	II	III	Total
1	ASIA	4	1	7	12
2	EUROPE	0	2	2	4
3	AMERICA	2	3	3	8
		6	6	12	24



**OVERVIEW OF THE NUMBER OF MEDALS TOGETHER IN ALL THREE STYLES BY CONTINENTS**

Here is an overview of all medals won by continent in one place. Wrestlers from Asia have been a great success, winning 36 out of 72 medals at the Olympic Games, or 50% of all medals. At these Olympic Games, wrestlers from Europe won a unassuming 24 medals.

GR	N/m	%	FS	N/m	%	WW	N/	%	TOTAL	N	%
ASIA	13	54.17	ASIA	11	45.8	ASIA	12	50.0	ASIA	36	50.0
EUROPE	7	16.67	EUROPE	9	16.6	EUROPE	8	16.6	EUROPE	24	33.3
AMERICA	4	29.17	AMERICA	4	37.5	AMERICA	4	37.5	AMERICA	12	16.6
Total =	24	100%		24	100		24	100		72	1.00



**OVERVIEW OF NATIONAL TEAMS BY TEAM POINTS WON**

**OVERVIEW OF NATIONAL TEAMS BY TEAM POINTS WON - BY STYLES**

**GRECO ROMAN STYLE (GR)**

36 national teams + AIN and EOR teams took part in the GR style, for which team points were not counted. There were national teams from 4 continents in GR.

The convincing first place in the team scoring went to the wrestlers of Iran who won 101 points. CUB and KGZ have a big gap in second and third place. However, these two countries are also the most pleasant surprise of this year's Olympics in wrestling. Although it has two Olympic champions, the Japanese team was only placed in 4th place. Among the top 10 national teams, five are from Asia, 4 from Europe and one from America.

A total of 30 national teams had wrestlers placed among the top 10 wrestlers in their weight category.

1	IRI	101		14	HUN	18		27	ECU	4
2	CUB	59		15	PRK	15		28	ROU	4
3	KGZ	55		16	DEN	15		29	EST	2
4	JPN	50		17	TUR	10		30	GER	2
5	ARM	45		18	POL	10		31	COL	0
6	CHN	35		19	VEN	10		32	ALG	0
7	UKR	35		20	MDA	8		33	HON	0
8	AZE	35		21	LTU	8		34	KOR	0
9	KAZ	34		22	SRB	8		35	MAR	0
10	BUL	29		23	FIN	6		36	TUN	0
11	UZB	28		24	FRA	6		37	AIN	0
12	EGY	22		25	USA	4		38	EOR	0
13	CHI	20		26	GEO	4				548

### FREE STYLE (FS)

41 national teams + AIN and EOR teams took part in the FS style, for which team points were not counted. There were national teams from 5 continents in the FS.

The national team of Iran is also the best in freestyle in the team ranking. This time the difference between the first and second place is not big and it is only 5 points more for Iran, ahead of the wrestlers of Japan.

Among the top 10 national teams, four are from Asia, 4 from Europe and two from America. In total, 31 national teams had wrestlers placed in the top 10.

1	IRI	83		16	TUR	15		31	SVK	2
2	JPN	78		17	GRE	15		32	EGY	0
3	USA	62		18	IND	15		33	VEN	0
4	UZB	50		19	UKR	12		34	GER	0
5	GEO	45		20	SRB	10		35	ALG	0
6	AZE	42		21	SMR	10		36	DOM	0
7	ALB	36		22	TJK	10		37	ITA	0
8	BUL	25		23	CHN	8		38	MEX	0
9	PUR	25		24	KAZ	8		39	MKD	0
10	BRN	25		25	CAN	8		40	NGR	0
11	KGZ	20		26	CUB	4		41	SAM	0
12	HUN	18		27	MDA	4		42	AIN	0
13	ARM	16		28	GBS	4		43	EOR	0
14	POL	16		29	AUS	2				557
15	MGL	16		30	RSA	2				

### WOMEN WRESTLING (WW)

36 national teams from 5 continents took part in WW style.

The Japanese national team is by far the best in WW in the team ranking. The USA team is in second place with a significant gap, while the Kyrgyzstan team is in third place with a big gap.

Among the top 10 national teams, four are from Asia, 4 from America and two from Europe. In total, 27 national teams had female wrestlers placed in the top 10.

1	JPN	130		13	IND	16		25	ROU	4
2	USA	93		14	GER	16		26	GRE	2
3	KGZ	45		15	NGR	16		27	TUN	2
4	CHN	45		16	COL	15		28	UZB	0
5	ECU	38		17	NOR	15		29	EGY	0
6	CUB	35		18	BRA	10		30	HUN	0
7	UKR	34		19	SWE	10		31	VEN	0
8	MGL	34		20	POL	8		32	KOR	0
9	TUR	31		21	LTU	8		33	ALG	0
10	PRK	25		22	AZE	6		34	ITA	0
11	MDA	22		23	BUL	6		35	GUM	0
12	CAN	20		24	FRA	4		36	NZL	0
										552

### OVERVIEW OF NATIONAL TEAMS BY TEAM POINTS WON – OVERALL

If the points from all three Olympic styles of wrestling (GR-FS-WW) are added together, Japan is convincingly in first place with 258 points. In second place is the national team of Iran with 184 points, and in third place is the USA with 184 points. A big surprise is represented by the teams of Kyrgyzstan and China in 4th and 5th place. Among the first 10 teams there are 4 teams from Asia, 3 teams from Europe and 3 teams from America. What is noticeable is that there is not a single national team from Europe among the first five teams. In total, 60 national teams + wrestlers under the flags of AIN and EOR took part in the Olympic wrestling tournament.

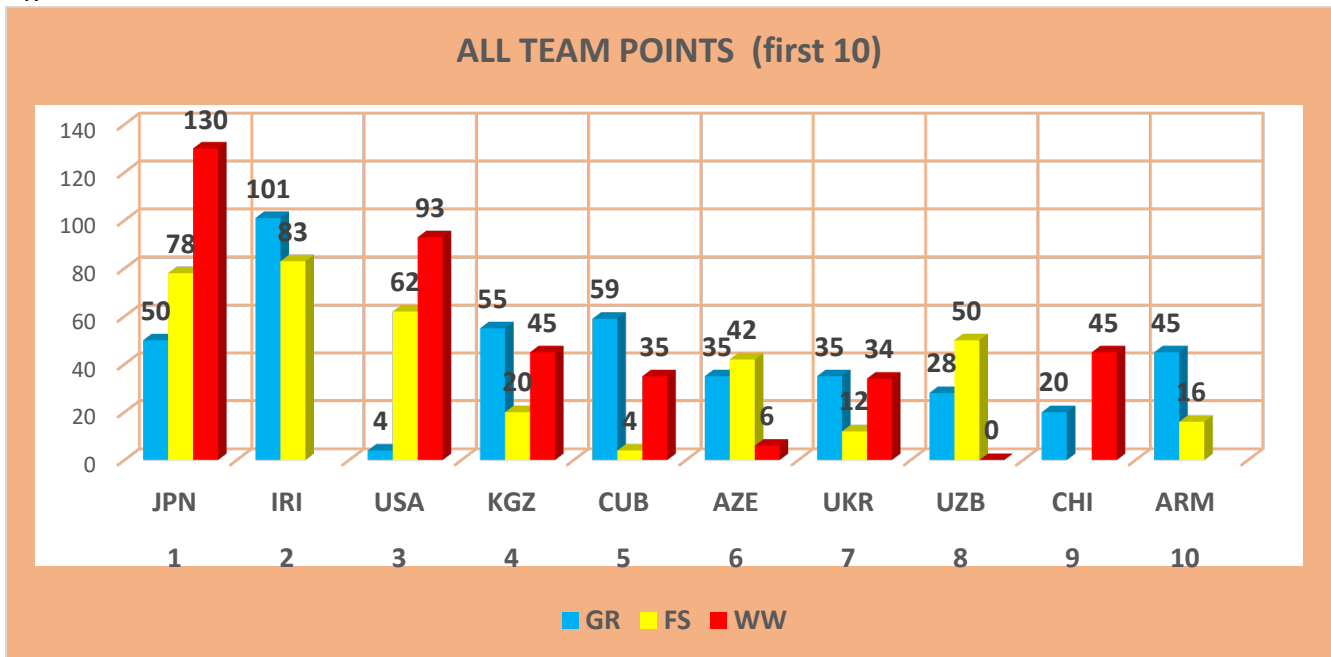
In total, 49 national teams from all 5 continents won points for the team ranking.

The following number of national teams performed by continent: Europe 25, Asia - 12, America - 12, Africa - 7, Oceania - 4. A total of 60 national teams + AIN (individual independent athletes) and EOR (refugee athletes). In total, 10 national teams won team points in all three wrestling styles, and 16 national teams had wrestlers in all three Olympic wrestling styles.



Rk	NAT	GR	FS	WW	Total	Rk	NAT	GR	FS	WW	Total
1	JPN	50	78	130	258	33	DEN	15			15
2	IRI	101	83		184	33	COL	0		15	15
3	USA	4	62	93	159	33	NOR			15	15
4	KGZ	55	20	45	120	36	VEN	10	0	0	10
5	CUB	59	4	35	98	36	FRA	6		4	10
6	AZE	35	42	6	83	36	SMR		10		10
7	UKR	35	12	34	81	36	TJK		10		10
8	UZB	28	50	0	78	36	BRA			10	10
9	CHI	20		45	65	36	SWE			10	10
10	ARM	45	16		61	42	ROU	4		4	8
11	BUL	29	25	6	60	43	FIN	6			6
12	TUR	10	15	31	56	44	GBS		4		4
13	MGL		16	34	50	45	EST	2			2
14	GEO	4	45		49	45	TUN	0		2	2
15	CHN	35	8		43	45	AUS		2		2
16	KAZ	34	8		42	45	RSA		2		2
16	ECU	4		38	42	45	SVK		2		2
18	PRK	15		25	40	50	ALG	0	0	0	0
19	HUN	18	18	0	36	50	DOM		0		0
19	ALB		36		36	50	GUM			0	0
21	MDA	8	4	22	34	50	HON	0			0
21	POL	10	16	8	34	50	ITA		0	0	0
23	IND		15	16	31	50	KOR	0		0	0
24	CAN		8	20	28	50	MAR	0			0
25	PUR		25		25	50	MEX		0		0
25	BRN		25		25	50	MKD		0		0
27	EGY	22	0	0	22	50	NZL			0	0
28	SRB	8	10		18	50	SAM		0		0
28	GER	2	0	16	18		AIN	0	0		0
30	GRE		15	2	17		EOR	0	0		0
31	LTU	8		8	16		Tot.: Points	682	686	630	1925
31	NGR		0	16	16		Tot.: nations	38	43	36	60

1.



## CONCLUSIONS

This year's wrestling tournament at the Paris 2024 Olympic Games produced many unexpected results. Two stand out in particular:

1. The Japanese team won a total of 11 medals in all three styles, of which 8 were gold,
2. The national teams of Asia were dominant in all three styles and won a total of 36 medals or 50% of the 72 medals awarded at the wrestling tournament.

The principle of universality was represented at these Olympic Games, as athletes from all 5 continents were represented. 60 national teams + athletes under the banner of AIN and EOR took part.

A total of 291 athletes took part in the Olympic tournament: GR - 97 male wrestlers, FS - 98 male wrestlers, WW - 96 female wrestlers.

In total, 26 national teams won medals at these Olympic Games (GR – 13, FS – 13, WW – 12).

A total of 49 national teams won team points (GR - 30, FS - 31, WW - 27).

According to the number of medals won, the most successful nations by style were: GR - Iran (4 medals), FS - Iran (4 medals), WW - Japan 6 medals. Overall, in all three styles, the most medals were won by Japan (11), Iran (8) and the USA (7).

# PSYCHOPHYSIOLOGICAL STATES OF ELITE WRESTLERS AFTER CRITICAL LIFE EVENTS

Georgiy Korobeynikov, Oleg Kokun, Ivanna Korobeinikova, Lesia Korobeinikova, Markus Raab

*Uzbek State University of Physical Education and Sport, Chirchik, Uzbekistan*  
*National University of Physical Education and Sport, Kyiv, Ukraine*  
*Institute of Psychology, Kyiv, Ukraine*  
*German Sport University Cologne, Institute of Psychology, Cologne, Germany*

k.george.65.w@gmail.com

## INTRODUCTION

The current stage of human development is characterized by the emergence of new risks and military conflicts. One of the large-scale ones is Russia's military aggression against Ukraine.



Negative consequences of the war can be mental disorders and post-traumatic stress in the civilian population (Kokun et al., 2023; Rzońca et al., 2024).



Some authors point to an increase in anxiety and distress among the population of Ukraine over the past two years (Kurapov et al., 2023; Predko et al., 2023).

More than 500 Ukrainian athletes and coaches were killed from 24.02.2022. However, in the conditions of war, Ukrainian athletes continue to train and participate in competitions.



## HYPOTHESIS

Our previous study showed that athletes have special mechanisms for adapting mental prevention in war conditions (Korobeinikova et al., 2024).



ORIGINAL ARTICLE

### Psychophysiological states of elite athletes after critical life events

Ivanna Korobeinikova<sup>1,2ABCE</sup>, Oleg Kokun<sup>1BCE</sup>, Markus Raab<sup>2BCE</sup>, Lesia Korobeinikova<sup>3,4BCD</sup>, Georgiy Korobeinikov<sup>3,4BCD</sup>, Vasil Kostiuhenko<sup>4CDE</sup>, Viktor Aksutin<sup>4BDE</sup>, Nataliia Dekha<sup>4BDE</sup>

<sup>1</sup> Kostiuk Institute of Psychology of the National Academy of Educational Sciences of Ukraine, Ukraine

<sup>2</sup> Institute of Psychology, German Sport University Cologne, Germany

<sup>3</sup> Uzbek State University of Physical Education and Sports, Uzbekistan

<sup>4</sup> National University of Ukraine on Physical Education and Sport, Ukraine

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

#### Abstract

**Background and Study Aim** Military conflicts are a stress factor that provokes negative changes in the mental state of people. But, how susceptible are athletes to post-traumatic disorders at the level of psychophysiological functions? The purpose is to study the psychophysiological state of the elite athletes after critical life events related to the war in Ukraine.

**Material and Methods** Twelve elite female fencers, aged 18-25 years and members of the National Team of Ukraine, were examined. Their mental condition was assessed using the Lüscher color test, neurodynamic functions were evaluated with an anticipation test, cognitive characteristics through a decision-making test, and levels of anxiety were also measured. The psychophysiological state of the fencers was studied both before and after six months of the Russian military aggression against Ukraine.

**Results** The results indicated changes in the mental state of fencers under military conditions. Six months after the onset of the war, elite fencers exhibited signs of mental stress and a decreased resistance



### Post-traumatic stress disorder among elite athletes affected by war

IVANNA KOROBEINIKOVA<sup>1</sup>, MARKUS RAAB<sup>2</sup>, SYLVAIN LABORDE<sup>3</sup>, OLED KOKUN<sup>4</sup>, LESIA KOROBEINIKOVA<sup>5</sup>, GEORGIY KOROBEYNIKOV<sup>6</sup>, SERHII ROMANCHUK<sup>7</sup>, WOJCIECH J. CYNARSKI<sup>8</sup>, DMYTRIY SHTANAGEY<sup>9</sup>, ANATOLII YEHORENKOV<sup>10</sup>

<sup>1,4</sup> Institute of Psychology, Laboratory of Age-Related Psychophysiology, Kyiv, UKRAINE

<sup>1,2,3,5,6</sup> Institute of Psychology, Section Performance Psychology, German Sport University Cologne, Cologne, GERMANY

<sup>5,6,9</sup> National University of Ukraine on Physical Education and Sport, Kyiv, UKRAINE

<sup>7</sup> National Academy of the Army, Lviv, UKRAINE

<sup>8</sup> Faculty of Physical Education, University of Rzeszow, Rzeszow POLAND

<sup>5,6</sup> Uzbek State University of Physical Culture and Sport, Tashkent region, Chirchik, UZBEKISTAN

<sup>10</sup> Bogomolets National Medical University, Kyiv, UKRAINE

#### PURPOSE

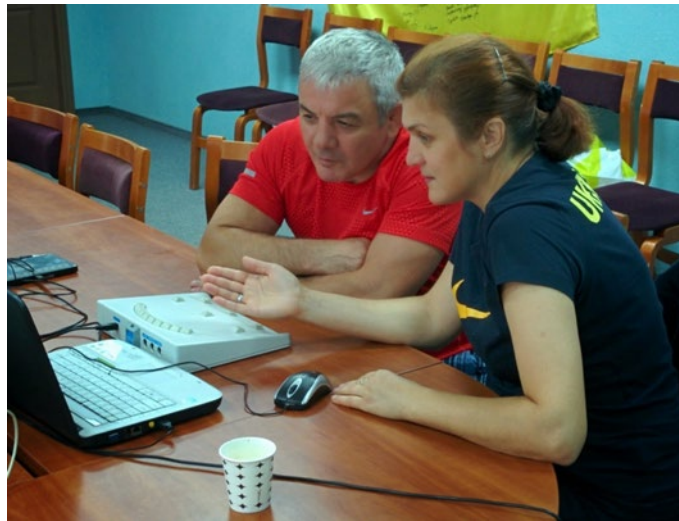
To study the psychophysiological state of elite athletes after critical life events (related to the war in Ukrainian).

#### SUBJECTS

19 elite Greco-Roman wrestlers (20-27 years old), members of the Ukrainian National Team, were examined.

#### METHODS

Mental state, cognitive and neurodynamic properties were studied. The study is carried out within six months from the moment of military aggression.



Mental state variables according to the Luscher test in elite wrestlers (median, lower and upper quartiles)

Variables	Before war	Six months after war
Fatigue, conditional unit	<b>2,00</b> 2,00; 4,00	<b>3,500*</b> 2,00; 8,00
Deviation from autogenously norms, conditional unit	<b>12,00</b> 8,00; 14,00	<b>14,00*</b> 10,00; 16,00
Eccentricity, secret unit	10,00 9,00; 12,00	10,00 7,00; 12,02
Heteronomy, conditional unit	<b>8,00</b> 6,00; 8,00	<b>6,00*</b> 5,00; 7,00

Legend: \* p = .05, for the pre-war period

## RESULTS

The study found that the wrestlers experienced mental strain and a tendency toward mental isolation over a six-month period of war. This result is consistent with mental fatigue in elite wrestlers.

Results of anticipation test in elite wrestlers (median, lower and upper quartiles)

Variables	Before war	Six months after war
Accuracy, number of errors	2,54 1,87; 3,00	2,56 2,16; 3,09
Stability, %	3,16 2,70; 3,61	3,43 2,85; 4,17
Arousal, conditional unit	<b>0,48</b> 0,00; 0,88	<b>0,81*</b> -0,01; 1,73
Arousal trend, conditional unit	<b>8,72</b> -39,20; 102,47	<b>37,09*</b> -82,44; 79,70

Legend: \* p = .05, for the pre-war period

The data obtained indicate the presence of a predominance of anxiety processes and the result of the influence of the stress factor caused by the war. This declined the anticipation of wrestlers.

Results of decision-making test in elite wrestlers (median, lower and upper quartiles)

<b>Variables</b>	<b>Before war</b>	<b>Six months after war</b>
Dynamism, conventional units	<b>70,37</b> <b>63,75; 71,96</b>	<b>56,29*</b> <b>55,53; 63,98</b>
Capacity of visual analyzer, conventional units	<b>1,53</b> <b>1,47; 1,55</b>	<b>1,37*</b> <b>1,23; 1,39</b>
Decision making time, ms	<b>380,00</b> <b>320,00; 410,02</b>	<b>500,00*</b> <b>380,00; 530,01</b>
Impulsiveness, conventional units	-0,36 -0,42; -0,27	-0,37 -0,45; -0,1

Legend: \* p =.05, for the pre-war period

The wrestlers showed slowness and quality of decision-making in response to environmental stimuli. In addition, as a result of war, there is a decrease in the performance of the visual analyzer and the ability to form new motor skills in elite wrestlers.

Results of anxiety test in elite wrestlers (median, lower and upper quartiles)

<b>Variables</b>	<b>Before war</b>	<b>Six months after war</b>
Situational anxiety, conventional units	16,72 13,52; 21,73	14,52 12,32; 26,17
Trait anxiety, conventional units	<b>36,28</b> <b>24,72; 40,41</b>	<b>48,31*</b> <b>39,62; 54,62</b>

Legend: \* p =.05, for the pre-war period

Anxiety in elite wrestlers increases with wartime. At the same time, the lack of changes in situational anxiety indicates the presence of stress resistance in elite wrestlers.

### **CONCLUSION**

The results showed that half a year after the start of the war, elite wrestlers experienced mental stress and a predominance of nervous system anxiety processes. As a result, there is a deterioration of the decision-making test. But the lack of change in situational anxiety acts as a compensatory mechanism for the prevention of post-traumatic stress.

### **Acknowledgement**

We thank the coaches and athletes of the Ukrainian Greco-Roman Wrestling Team for participating in the study, as well as the German Sport University Cologne. This research was supported by a Grant from the Volkswagen Foundation.

## COMMENTARY

# PROPOSAL FOR CHANGES IN COMPETITION SYSTEM AND WRESTLING RULES FOR 2025

Milorad Dokmanac

College of Higher Vocational Studies "Sports Academy" Belgrade, Serbia

dokns1@yahoo.com

At the Olympic Games in Paris, the wrestler (130 kg GR style - Chile) won the **silver medal without scoring a single point**. The judges awarded him 3 points for passivity and with 3 ground defenses he won a medal at the Olympic Games. This must be the reason to start making important rule changes when it comes to GR style. The biggest problem is the gifted passivity point. In my opinion, **giving points for passivity in GR style must be removed**.

**During the Olympic Games in Paris, I talked a lot with coaches from all over the world. On the basis of those conversations, I prepared the following proposals, which were supported by everyone.**

### **INTRODUCING THE RULE THAT WHEN THE RESULT IS 1-1 THE WRESTLER WHO WON THE FIRST POINT IN THE MATCH WINS WOULD BE DESTRUCTIVE**

If this rule is introduced, in that case the greco-roman style of wrestling will go into even bigger problems and will not recover for a long time from such a bad rule. It is a big problem that a lot of coaches are in advancing the introduction of this rule. If the wrestler who scores the first point wins, we have the following problems in gr style:

- from the start of the match, both wrestlers will go on the offensive to show that they are active and that they should be rewarded for that activity. That activity will in 90% of cases be exclusively dragging the arms without any desire to perform a wrestling throw, only tempo work.
- performing wrestling throws with yourself always carries a significant risk. None of the wrestlers will be at risk in the first minute of the match. Why would he do that, when the judge can award him that first point, which in a large number of cases, often decides in that match;
- if this rule is applied, there will be an even greater possibility for the referees to decide who will win the match. This rule opens great possibilities of manipulation with the judges and great pressure on them to award the first point to a certain wrestler.
- in this case, if the wrestler who wins the first point wins, the first minute will decide, when all the wrestlers have strength and freshness and in that case there will not be any big differences in activity. This makes the job significantly difficult for the judges (in some cases, it will be a great excuse when the judges want to help someone), because their mistake will not be that big and visible, because as a rule, after the first minute is up, they have to decide to whom to give passiveness and 1 point.
- all this will have further significant consequences on the course of the fight, because the wrestler who loses 1-0 will have to enter into risky actions, which the opponents will often use.
- on the basis of the above, if it is introduced that the wrestler who wins the first point wins, greco-roman style will definitely fall even more in attractiveness.
- at the last olympic games in paris, in gr style the number of points per minute of fight (wq/min) was average – 1.46, in fs – 2.09, in ww – 1.86.
- another important parameter is the number of points that are not wrestling techniques. In this case gr style is - 34.65% other points, fs - 19.02 other points (passivity, warnings, challenge...), ww - 14.64 other points.
- these two data say enough that radical changes are needed in gr style rules.



## HOW TO IMPROVE THE BASIC PARAMETERS OF A GR STYLE WRESTLING MATCH:

### REMOVAL OF PASSIVITY POINTS

At the last olympic games in 130 kg, the silver medal was won by a wrestler from chile, who achieved the medal, with three successfully defended parter, without making a single technical point in 18 minutes. The judges awarded him 3 times with a point for passivity in the second round. In that way, he achieved 3 victories and a silver medal. Is it possible to imagine someone entering the finals of the olympic tournament. For example: in football without scoring a single goal, but seeing who had more corners or outsides. That can only happen in gr style wrestling now. If these rules remain, or an even worse rule is applied (the wrestler who wins the first point wins), the question is whether gr style wrestling will be represented in the program of the olympic games in the next period. For this reason, radical moves, but very simple changes must be approached and that: 1. Abolition of points for passivity (to remain the parter's choice), 2. Exclude awarding points for getting off the mat (only public warning and 2 points because escape the mat, 3. Strict enforcement of article 49 of the rules of wrestling as it relates to negative wrestling.

### Specific conclusions:

- it is necessary to cancel the gift of passivity points, and to keep the choice of standing or floor position.
- if the result is 0-0, overtime is up to 3 minutes, that is, until the first point is earned, if then it is still 0-0, disqualification in the elimination matches.
- in the matches: semi-finals, last rounds of repeaches and medal matches, overtime up to the first technical point is up to a maximum of 3 minutes.
- if after 9 minutes the result is 0-0 in the matches: finals, semi-finals and the last matches of the repassage, in that case, the referees are the ones who should decide who was more active and award him the victory.
- the current rules allow the referees to significantly influence who will be the winner already at the very beginning of the match in the first minute of the fight, which is all written about in the introduction.
- the number of these matches where there will be no points (even if the gift of points for passivity is abolished) is not big and it amounts to about 5% of the entire championship.
- the number of these matches in which there will be no points (if the gift of points for passivity is abolished) is not big and amounts to about 5% of the entire championship. At the olympic games only 7 matches ended with a result of 1-1 (of these number 4 matches were at 130 kg). Therefore, even if the gift of passive points is abolished, a very small number of matches will end with a result of 0-0. However, the main tool will be taken from the judges, which is to award about 20% of points to the wrestlers. I guess it's normal that the wrestlers have to decide who is better, and not for the judges to assume that role.

## OTHER NECESSARY CHANGES IN THE RULES AND ORGANIZATION OF THE COMPETITION

### 1. WEIGH-IN

- Weigh-in of competitors on the first day immediately after the lot is drawn in that style and the day before the start of the competition.
- technical conference from 3 to 3.30 pm.
- first weigh-in of competitors from 4:00 pm to 4:30 pm.
- second weigh-in after the semi-final matches from 6-8 p.m., for wrestlers who have qualified in the repassage and in the medal fights on the following day.
- in this way, a space is opened for a longer rest for the wrestlers and that the qualification matches can start at 10,30 or 11 o'clock, so that a lunch break could be made, because in this way the sessions will not be combined.
- another big advantage of this proposal is for competition organizers who will not have a problem with the organization of the breakfast, which presents a big problem to every organizer and significantly increase the costs of organizing the competition.
- can it be imagined that npr. In tennis (Djoković, Federer, Nadal) they have to get up at 6 in the morning and go to the tennis equipment check, which happens at 8 o'clock, and then at 10 o'clock they play the first match. Nobody does that to their top athletes, only wrestling. Everything was attempted to reduce the big weight loss in wrestling. Despite all their efforts, the wrestlers still lose 8-10 kg, although they have to be on the mat for two hours after the weigh-in. It was not successful in that intent and then it is better to allow the wrestlers to wake up in the morning at the normal time, have breakfast and mentally prepare for the start of the competition, and the main result will be much more quality and better wrestling matches in the morning session.

## 2. APPLICATION OF THE RULE FOR PUNISHING NEGATIVE WRESTLING

Mandatory application of negative wrestling – holding and crossing the fingers (Article 47, paragraph 1, paragraph 8). This way there will be many more technical points if the referees start applying this rule, there will be very few matches which will end with a 0-0 result, that is, there will be definitely none.

## 3. CHANGES IN GR STYLE WEIGHT CATEGORIES

Changes in the weight categories of gr style: and freestyle cannot be made without fulfilling someone's wishes and adjusting the categories to their wrestlers that suit them at the present moment. After a certain time someone will again ask for the weight categories to be changed so that someone influenced in the uww could adjust the weight categories for their wrestlers. For that reason there is no justification to change weight categories often. The only two proposals make logic and sense:

### Greco Roman

Freestyle did a reasonable space between weight categories, but in gr style it was done very badly. The world's population has most people weighing 80-100 kg. For the stated reason, there is only justification to drop 55 kg (the Japanese who invented judo started at 60 kg) so that says enough to make 60 kg. For tv, the media, the public, it is much more interesting when 90 and 100 kg wrestlers appear in the fight, and not 55 kg.

- for the above reason, the specific proposal is to remove 55 kg, and to introduce 93 kg and to raise the floor from 97 to 100 kg. All other categories would not change. The benefit would be very great. GR style is a sport of strength and the wrestlers have much larger muscle mass than the freestyle wrestler whose basic characteristic is speed. Then there is no justification for the first category in gr style to be 55 kg and in freestyle 57 kg.
- instead of 55 kg to introduce a new category in gr style 93 kg. And category 97 kg to move to 100 kg.
- Categories / proposal category gr style: **60**, 63, **67**, 72, **77**, 82, **87**, 93, **100**, **130**.
- Span 3kg 4kg 5 kg 5 kg 5 kg 5 kg 6 kg 7 kg 30 kg
- (bold: Olympic categories)
- Now the gap between the two categories is: 87 kg -97 kg / a total of 10 kg, which is a very big difference.

### CHANGES IN WOMEN'S WEIGHT CATEGORIES.

Since in WW in some categories there is only a 2 kilogram spacing between the two categories, the suggestion is to move to more, to a minimum of 3 kg, for the last categories that the spacing is a 4 kg difference. As well as that the last category be raised to 80 kg. In judo there is a +78 kg category where women perform with over 100 kg, which is certainly not good. If he gets up to 80 kg, it would be a real measure in WW wrestling.- proposal of new categories in WW - 50,53,56,59,63,66,69,72,76,80.

Categories	<b>50kg</b>	<b>53kg</b>	56kg,	<b>59kg</b> ,	63kg,	<b>66kg</b> ,	69kg,	<b>72kg</b> ,	76kg,	<b>80kg</b>
Span	3 kg	3 kg	3 kg	3 kg	3 kg	3 kg	3 kg	4 kg	4 kg	

(bold: Olympic categories)

### CURRENT CATEGORIES WW

CATEGORIES	<b>50kg</b>	<b>53kg</b>	55kg,	<b>57kg</b> ,	59kg,	<b>62kg</b> ,	65kg,	<b>68kg</b> ,	72kg,	<b>76kg</b>
SPAN	3 kg	<b>2 kg</b>	<b>2 kg</b>	<b>2 kg</b>	3 kg	3 kg	3 kg	4 kg	4 kg	

One of the important reasons why there must be a 3 kg spacing between two categories is that in all international tournaments there is a 2 kg tolerance and if there is a 2 kg spacing between two categories it means that the two categories are practically combined.

## COMMENTARY

# PROPOSAL FOR THE FORMATION OF CATEGORIES IN WOMEN'S WRESTLING ACCORDING TO STATISTICS AND ANTHROPOLOGICAL CHARACTERISTICS BY CONTINENT

Ioannis Barbas

Democritus University of Thrace

impampa@phyed.duth.gr

The formation of weight classes in wrestling is done by United World Wrestling (UWW), with the aim of balancing the physical capabilities of the athletes and promoting fair competition. Weight categories are formed taking into account the physical characteristics of female athletes, participation statistics and differences by continent. Based on data on average kilograms per continent and women's participation in wrestling, ten weight classes have been proposed that correspond to different levels of body weight and competition.

- Many federations are promoting women's participation in wrestling through development and training programs, which is expected to increase participation rates in the coming years.
- Data on women's participation in wrestling comes from various sources, such as official federations, research studies and sports organizations.
- Academic studies and research: A number of academic articles and research in the field of sport sociology and sports science examine women's participation, including wrestling.
- Some reliable sources to find information about women's participation in the sport of wrestling include:
  - UWW Official Website: <https://uww.org> M. Dokmanac
  - IOC Gender Equality Reports: <https://olympics.com/ioc/gender-equality>
  - Women in Sport: <https://www.womeninsport.org>
  - INWR - International Network of Wrestling Researchers <https://inwr-wrestling.com/>

Women's participation in Olympic wrestling varies considerably by continents, with some regions having a more developed tradition in the sport and others still in development. The average participation of women in Olympic wrestling by continent can be estimated as follows:

- Europe has the largest participation of women in Olympic wrestling, thanks to a long tradition and strong support from sports federations.
  - The participation rate: About 30-35% of female athletes worldwide come from Europe.
- Asia also has high participation rates,
  - Estimated participation rate: About 25-30% of female athletes are from Asia.
- In the Americas, most entries come from North America (USA, Canada), while participation in Latin America is more limited.
  - Estimated participation rate: About 20-25%.
- Africa has the lowest participation rate in women's wrestling events, although the growth of the sport is gradually increasing through support programs.
  - Estimated participation rate: About 5-10%.
- In Oceania, participation is limited, with Australia and New Zealand having a small number of female athletes in wrestling.
  - Estimated participation rate: Less than 3%.

Participation is influenced by sporting tradition, support from national federations, and societal perceptions of women's participation in sport. In order to formulate ten (10) weight classes for women in Olympic wrestling, it is important to consider the following factors:

- Physical characteristics and body type of female athletes by continent.
- Percentage of women's participation in wrestling by continent.

- Percentage of women's participation in wrestling by country & region
- International regulations and existing divisions established by United World Wrestling (UWW).

Female wrestlers are in the range of 50-76 kg according to the weight categories, with the average of female athletes ranging from 60-70 kg.

- Average body weight in Europe varies by country, age, gender and other factors. Nevertheless, in general, the average is at the following levels:  
For women, the average is around 65-70 kg.
- Average body weight in Asia varies greatly by country due to cultural, dietary and genetic factors. However, general estimates of average body weight are:  
For women, the average is around 50-60 kg.
- In the American continent, the average body weight is generally higher compared to other continents, due to factors such as diet, lifestyle, and urbanization. The general considerations are as follows:  
For women, the average is around 70-80 kg.
- Average body weight in Africa varies due to factors such as less developed sports infrastructure, eating habits and lack of wider promotion of the sport  
Average body weight in Africa is around 60-65 kg.

These sources offer official and up-to-date data on body weight in different regions of the world, with comparisons between continents and countries.

- World Health Organization (WHO): The World Health Organization publishes reports and data on obesity and body mass index (BMI) by country.
- WHO Global Health Observatory: <https://www.who.int/data/gho>
- Centers for Disease Control and Prevention (CDC): The CDC provides statistics on body weight in the US that can be used as a proxy for North America.
- CDC - National Health Statistics Reports: <https://www.cdc.gov/nchs/fastats/body-measurements.htm>
- Our World in Data: Provides detailed health data, including body weight and obesity around the world.
- Our World in Data - Obesity: <https://ourworldindata.org/obesity>

These sources offer official and up-to-date data on body weight in different regions of the world, with comparisons between continents and countries.

- World Health Organization (WHO): The World Health Organization publishes reports and data on obesity and body mass index (BMI) by country.
- WHO Global Health Observatory: <https://www.who.int/data/gho>
- Centers for Disease Control and Prevention (CDC): The CDC provides statistics on body weight in the US that can be used as a proxy for North America.
- CDC - National Health Statistics Reports: <https://www.cdc.gov/nchs/fastats/body-measurements.htm>
- Our World in Data: Provides detailed health data, including body weight and obesity around the world.
- Our World in Data - Obesity: <https://ourworldindata.org/obesity>

Recommended 10 weight categories for women from 50 to 80 kg. These categories will be formed based on physical variations by continents, taking into account the need for balance between lighter and heavier athletes. Each category tries to meet different needs depending on participation and body type.

50, 53, 57, 60, 63, 67, 70, 73, 76, 80

These categories cover the weight range from 50 to 80 kg, with a balance between lighter and heavier athletes. Classes cater to the needs of different body types, taking into account geographic diversity and the growing participation of women in wrestling internationally.

## INSTRUCTIONS FOR AUTHORS

The *International Journal of Wrestling Science* 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. Topics include:

- Training Science
- Physiology
- Psychology
- Sports Medicine
- Biomechanics
- Nutrition & Weight Management
- Pedagogy
- History
- Sociology
- Sports Management

The *International Journal of Wrestling Science* regularly features: Original Papers, Review Articles, Technique Analyses, Scoring Analyses, Case Studies/Profiles and Letters. The Journal publishes on behalf of the International Network of Wrestling Researchers and in association with the sport's international governing body, United World Wrestling (UWW), with its 180 national affiliates. The readership for this Journal is varied and ranges from academics to coaches and other professional practitioners from a range of disciplines and areas of application.

**Manuscript Submissions.** All manuscript submissions are subject to initial appraisal by the Editor (send to [davcurb@gmail.com](mailto:davcurb@gmail.com)), and, if found suitable for further consideration, to peer review by independent, anonymous expert referees. All peer review is single blind and submission is online directly to the editor. Manuscripts will be blindly reviewed by two reviewers. Acceptance for publication will be based on quality, originality and reliability of the presented material. Whenever necessary, accepted manuscripts are returned by e-mail to the authors for corrections. After making the corrections, the authors have to resend the manuscript, to the Editor with detailed information about the alterations for each one of the reviewers' comments. Send your manuscript directly to the editor as a WORD document. Please note that International Journal of Wrestling Science uses Crossref™ to screen papers for unoriginal material. By submitting your paper to International Journal of Wrestling Science you are agreeing to this originality verification during the peer-review process. Each manuscript must be accompanied by a statement that it has not been published elsewhere and that it has not been submitted simultaneously for publication elsewhere. Authors are required to sign an agreement for the transfer of copyright to the publisher you want to reproduce any figure, table, or extract from the text of another source. This applies to direct reproduction as well as which will be sent to them after submission. All accepted manuscripts, artwork, and photographs become the property of the publisher. As an author, you are required to secure permission if "derivative reproduction" (where you have created a new figure or table which derives substantially from a copyrighted source).

**Preparation of Manuscript.** All parts of the manuscript should be typewritten, double-spaced, with margins of at least one inch on all sides. Number manuscript pages consecutively throughout the paper. Authors should also supply a shortened version of the title suitable for the running head, not exceeding 50-character spaces. Each article should be summarized in an abstract of not more than 200 words. Avoid abbreviations, diagrams, and reference to the text in the abstract.

**Article Publishing Charge.** The standard article publishing charge (APC) for this journal is US\$200. Depending on your location, these charges may be subject to local taxes. Waivers and discounts on the APC are available to support researchers in developing and emerging regions unable to pay this charge.

**Style and Format.** Manuscripts must be submitted in English and prepared in accordance with the American Psychological Association (APA) Publication Manual, 6th ed. An Abstract in English must be included. The maximum length of manuscripts is 10 pages (8.5 by 11 inches) (including tables, figures, pictures, and references). They should be 1.5 spaced, in 12-point Arial type throughout the paper, with .75 inch margins, and be written according to proper grammar, and syntax principles.

The complete manuscript must include: TITLE PAGE, with:

a) Complete title, b) names and affiliations of all authors in the order they appear, c) contact information for readers (name, institution address, e-mail). Number manuscript pages consecutively throughout the paper. Abbreviations must be defined with first use. **ABSTRACT:** (in English): Unstructured Abstract and 3-6 Key words on a separate page, following the title page. Length should be less than 250 words. **INTRODUCTION:** starting on a separate page and ending with the purpose of the study and the corresponding hypotheses. **METHODS:** which includes a) Participants, b) Instruments-Tests, c) Procedures, d) Research design, and e) Statistical analysis. **RESULTS; DISCUSSION; CONCLUSIONS; and PRACTICAL IMPLICATIONS and ADVICE FOR ATHLETES AND COACHES**

**References.** A reference list in alphabetical order should be included at the end of the paper. Footnotes are not to be used. Authors should only include references which have been published or accepted for publication. They should also check that all references are actually cited in the body of the paper e.g. (Curby & Jormand, 2015), and all citations in the paper are included in the Reference list. References, citations, and general style of manuscripts should be prepared in accordance with the American Psychological Association Publication Manual, 6th ed. All references must be alphabetized by the first author's surname. Titles in sentence case, no capital after colon.

**Tables and Figures.** The number of tables and figures must be limited and must be explanatory, supplementary and non-repetitious of the text. A brief title is given on the top (for the tables) or on the bottom (for the figures). All tables and figures must be referenced in the text. It is forbidden to cite other authors' tables or drawings unless a copy of written permission is enclosed to the Editorial Staff of the Journal. Please supply editable files. Equations must be editable. Please use SI units (non-italicized).