

METHODOLOGY

In March 2015, in the first International Society for Sports Science in the Arab World (I3SAW) congress which was held in Oran (Algeria) Nadim Nassif, PhD, Assistant professor in Notre Dame University Lebanon, has presented a methodology aiming at ranking annually the 206 countries having NOC¹ in all the sports recognized by Sportaccord and others not yet recognized but generating massive revenues (ex: Mixed Martial Arts, rugby league). To honor the I3SAW that gave him the opportunity to present his idea in a scientific congress, he first called this ranking the I3SAW ranking for countries in elite sport, which methodology was published in a scientific article². **The name “World Ranking of Countries in Elite Sport” was officially established and copyrighted in August 18th, 2017.** The updated methodology of the “World Ranking Countries in Elite Sport” was also published in the scientific revue entitled “Rivista Di Diritto Ed Economia Dello Sport”³.

This methodology is characterized by:

- a) A weighted points system in every event, discipline, or sport ^[1]_[SEP]
- b) The introduction of universality and popularity coefficients for each event, discipline or sport. **Popularity** indicates the **international media ratings for each sport**. It shows to which extent a sport is covered and therefore attracts private and public funding and raises competition’s level by engaging the most talented athletes. **Universality** takes into account the **number of all countries participating in a given sport**. The more there are countries participating, the more difficult it is for them to win in an event.
- c) A computation model that attributes to each country its share of points in at least one sport and consequently its ranking based on the total number of points that this country would have acquired

¹ In some sports where countries like England, North Ireland, Wales or Scotland participate, the best ranking obtained by one of these countries will count for Great Britain. Same case for Tahiti and New Caledonia, which points will go for France in case they are ranked ahead of France in a specific sport. Same case for Macau, which points will go for China in case it is ranked ahead of China in a specific sport.

In Cricket, the points won by West Indies will be divided by 12 and will be allocated to Antigua and Barbuda, Barbados, British Virgin Islands, Dominica, Grenada, Guyana, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and The Grenadines, Trinidad and Tobago and Virgin Islands.

² Nassif, N. (2017) *Elite Sport Ranking of the “International Society of Sports Sciences in the Arab World”*: An accurate Evaluation of all Nations’ Performances International Sports Competitions. Athens Journal of Sport, Vol.4, N.1

³ Nassif, Nadim. "World Ranking of Countries in Elite Sport." *Rivista di Diritto ed Economia dello Sport* 14, no. 2 (2018): 55-75.

in all sports. ^[1]_{SEP}

These features are the conductive line of this ranking. For the sake of improvement, the methods to calculate the universality and popularity coefficients have been slightly modified since the first edition in 2014. The starting point of this methodology is a pointing system in any event, discipline, or sport (see glossary in Table 1).

Table 1. Glossary

Term	Definition	Examples
Sport	A group of disciplines or events that belong to the same international federation	Aquatics
Discipline	A branch in a sport comprising one or more events	Swimming is a discipline in the sport of aquatics
Event	A competition in a sport or discipline that gives rise to a ranking	Men 50-M freestyle is an event of the discipline of swimming that belongs to the sport of aquatics

Since the number of National Olympic Committees is 206, any winning team or athlete participating in an event whether it is in a team sport (basketball, football, handball ...) or individual sport (i.e. athletics, swimming, wrestling ...) gets a basic score of 206, the second getting 205, the third 204, and so on. To reward the top eight participants in every event, we introduced a weighting coefficient inspired by the formula 1 scores between 2003 and 2009. So, the winner of the event will have his basic points multiplied by 10, the second by 8, the third by 6, the fourth by 5, the fifth by 4, the sixth by 3, the seventh by 2, and the eighth by 1, as summarized in Table 2.

Table 2. Weighted pointing system

Rank in an event, discipline or sport	Basic Number Points awarded on the basis of number of Olympic committees: NP_basic	Weight (Formula 1 2003-2009 scale)	Weighted basic number of points: NP_weighted
1	206	10	2060
2	205	8	1640
3	204	6	1224
4	203	5	1015
5	202	4	808
6	201	3	603
7	200	2	400
8	199	1	199
9	198	1	198
10	197	1	197
11	196	1	196
.....
206	1	1	1

As Table 3 shows, in the case where an individual sport with more than one competitor from each country, a total number of points per event for each country is obtained by summing up the points received by its athletes in that event.

Table 3. *Example of ranking and scaled points granting for a country in an event E*

Ranking of athletes in event E	Points	Corresponding Ranking of countries in event E	Points
1 USA	2060	1. Brazil 2836 (1624+1212)	2040
2 Brazil	1640	2. USA (2040)	1640
3 Brazil	1224	3. France 1202 (1005+197)	1224
4 France	1015	4. Italy (993)	1015
5 Spain	800	5. Spain (800)	800
6 Italy	603		
7 Italy	400		
8 France	199		

In case there are more than 206 athletes in an event of an individual sport, countries that have no athlete ranked in the top 206 will still have points if the top 206 athletes are from less than 206 countries. These countries will be ranked below the last ranked country that has one of his athlete in the top 206. The more they have athletes ranked after 206, the better their ranking will be. This was done to make sure that every country that participates in a sport will get points.

If a sport has several disciplines (such as aquatics, which includes the disciplines of swimming, water polo, synchronized swimming, and diving), the points won in every event are computed by discipline (see Table 4) and the points won in every discipline are computed by sport (see Table 5), following the same pointing system: 2060 for the first, 1640 for the second, 1224 for the third, 1010 for the fourth, 808 for the fifth, 603 for the sixth, 400 for the seventh and 199 for the eighth. Those who are ranked below will have points that decrease from 198 to 1. So, if we take as an example the sport of Aquatics, the points won by a country in every event (examples: Men 50 M freestyle, 100 M women backstroke, 200 M men Medley) are computed by discipline (swimming, water polo, synchronized swimming, and diving). The points by countries in each discipline are then computed to give the final ranking of the sport of Aquatics. If a sport does not have any discipline (such as athletics), the points won in every event will be computed by sport (see Table 6). This method was applied to avoid having a sport that has a multitude of events (athletics, aquatics, boxing) award more points than a team sport that has just two events (example of basketball: men/women).

Table 4. *Sample of disciplines in which the “summing-up rule” of events is being applied*

DISCIPLINES EXAMPLES	POINTS
Swimming	Sum of the points gained in the different men's and women's swimming events (100 M Freestyle men, 100 M Freestyle women, 200 M Butterfly men, 400 M Freestyle relay ...) country rankings
Water Polo	Sum of the points gained in the men's and women's water polo events country rankings
Diving	Sum of the points gained in the different men's and women's diving events (Individual 3 M springboard men, Individual 10 M platform women, Synchronized 10 M platform, 400 M Freestyle relay ...) country rankings

Table 5. *Sample of sports in which the “summing-up rule” of disciplines is being applied*

SPORTS EXAMPLES	POINTS
Aquatics	Sum of the points gained in the different aquatics disciplines: Diving, Swimming, Synchronized Swimming and Water Polo country rankings
Cycling	Sum of the points gained in the different cycling disciplines: BMX, Mountain Biking, Road and Track Cycling country rankings
Equestrian	Sum of the points gained in the different equestrian disciplines: Dressage, Eventing and Jumping country rankings

Table 6. *Sample of sports in which the “summing-up rule” of events in sports not having*

<i>different disciplines is being applied</i>	
SPORTS EXAMPLES	POINTS
Athletics	Sum of the points gained in the different men's and women's athletics events (pole vault, long jump, high jump, triple jump, 100M, Marathon ...) country rankings
Boxing	Sum of the points gained in the men's and women's weight categories events country rankings
Rowing	Sum of the points gained in the different men's and women's rowing events (Single sculls men, Pair women, eight men...) country rankings

Popularity and universality coefficients

Popularity and universality coefficients are used to weight some of the events where there is a large difference between men and women, whether the superiority goes for the men (football, basketball, boxing, baseball, cricket, golf, ice hockey, American football, handball, rugby union, rugby sevens, road cycling, futsal, rugby league, Australian football and sumo) or for women (netball and softball). The points gained in the different men's and women's events will be multiplied by these coefficients before doing their sum that will lead to the rankings of disciplines. In the sports where there is not a large difference between men and women, the events will not be weighted.

The points gained in the different disciplines will be multiplied by their popularity and universality coefficients before doing their sum that will lead to the rankings of sports.

The points won in the different sports will be multiplied by their popularity and universality coefficients.

Universality coefficients

The universality coefficients is calculated based on the sport's number of national federations, its presence in the programs of the Olympics, the International School Sport federation (ISF), International University Sport Federation (FISU), International Sport Military Council (CISM), International Master Games Association (IMGA), World Transplant Games Federation (WTGF), Special Olympics, Deaflympics, Workers and Amateurs' International Federation (CSIT), the International Children's Games Association (CICG) and the International Police Sport Union (USIP), all multisport organizations recognized by the IOC. The universality coefficients were calculated in this way:

- They were rescaled by 100 to achieve a total universality coefficient between 0 and 100. If the points won by the countries were multiplied by a coefficient number that was not rescaled by 100, the total number of points won by each country would be too high and would therefore not be easily readable and used by researchers, media, or sport organizations.^[1]_{SEP}
- When a sport is part of the Olympic program, the total number of federation ratings would be equal to its number of federations.
- If a sport recognized by the ISF has less than 116 affiliated countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport that is part of the FISU Program has less than 173 affiliated countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport recognized by the CISM has less than 138 affiliated countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport recognized by the IMGA has less than 100 affiliated countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport recognized by the WTGF has less than 59 countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport recognized by the Special Olympics has less than 172 affiliated countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport recognized by the Deaflympics has less than 113 affiliated countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport recognized by the CICG has less than 32 affiliated countries, the points of this sport would be the number of these countries divided by 100.^[1]_{SEP}
- If a sport recognized by the CSIT has less than 31 affiliated countries, the points of this sport would be the number of these countries divided by 100.
- If a sport recognized by the USIP has less than 71 affiliated countries, the points of this sport would be the number of these countries divided by 100.

This is shown in Table 7:

Table 7. Example of the attribution of Universality coefficients in the 2019 WRCES	
	Athletics
Number of federations / 100	2.06
Olympics program coeff. = (Number of federations / 100)	2.06
ISF program coeff. = min (116, Number of national sport school federations) / 100 (116 being the max number of National schools sports federations)	1.16
FISU program coeff. compulsory = min (173, Number of national University sport federations) / 100. (173 being the max number of National University sports federations)	1.73
CISM program coeff = min (138, Number of national Military sport federations) / 100 (138 being the max number of National Military sports federations)	1.38
IMGA program coeff = min (100, Number of national master sport federations) / 100 (100 being the max number of National Master sports federations)	1
Transplant games program coeff = min (59, Number of national transplant games sport federations) / 100 (59 being the max number of National Transplant games sports federations)	0.59
Special Olympics program coeff = min (172, Number of national Special Olympics federations) / 100 (172 being the max number of National Special Olympics sports federations)	1.72
Deaflympics program coeff = min (113, Number of national Deaflympics sports federations) / 100 (113 being the max number of National Deaflympics sports federations)	1.13
Children games coeff = min (32, Number of national Children games sport federations) / 100 (32 being the max number of National Children games sports federations)	0.32
Workers and Amateurs coeff = min (31, Number of national workers and amateurs sport federations) / 100 (31 being the max number national of workers and amateurs sport federations)	0.31
USIP coeff = min (71, Number of national police sport federations) / 100 (71 being the max number of national police sport federations)	0.71
Total Universality	14.17

If within a sport (such as cycling, for example), there is a difference in terms of universality

between the different disciplines (road cycling, track cycling, mountain biking ...) there would be a difference in the universality coefficient between them. Nevertheless, because the same international federation (International Cycling Union) runs them, the total of the universality coefficients of the different cycling disciplines will not be superior to the universality coefficient of the sport of cycling (see Table 8).

Table 8. Universality coefficients of the different disciplines within the sport of cycling	
	Universality coefficient
Cycling	14.35
Road Cycling	9.9
Track cycling	5.01
Mountain biking	6.71
Cyclo-cross	0.78
BMX	1.30
Trials	0.31
Indoor	0.17

Popularity coefficient

For the popularity coefficient, we will first measure in a one-year span, the frequent presence of the different sports in each country's major sport website (those websites were identified by searching on Alexa.com. Since there are many differences in popularity between events within a discipline (between men's football and women's football, for example) or between disciplines within a sport (between football and futsal, as examples), we will look to the most popular sport event. In every country, the most popular sport event would get a score of 100. If a country has eight popular sports events (that have a weekly appearance on the top sport website), the most popular sport event in this country would still get a score of 100 and the other seven sport events that are ranked below would get points according to the rule of three, with the less popular of these sports getting 1 point.

As an example, if men's football is the most popular sport event in France, it would get 100. The seven others will get:

$$(\text{Points for the 2}^{\text{nd}} \text{ most popular event} * 100) / 8 = (7*100)/8 = 87.5$$

$$(\text{Points for the 3}^{\text{rd}} \text{ most popular event} * 100) / 8 = (6*100)/8 = 75$$

$$(\text{Points for the 4}^{\text{th}} \text{ most popular event} * 100) / 8 = (5*100)/8 = 62.5$$

$$(\text{Points for the 5}^{\text{th}} \text{ most popular event} * 100) / 8 = (4*100)/8 = 50$$

$$(\text{Points for the 6}^{\text{th}} \text{ most popular event} * 100) / 8 = (3*100)/8 = 37.5$$

$$(\text{Points for the 7}^{\text{th}} \text{ most popular event} * 100) / 8 = (2*100)/8 = 25$$

$$(\text{Points for the 8}^{\text{th}} \text{ most popular event} * 100) / 8 = (1*100)/8 = 12.5$$

The sports that have a lower popularity will have less than 12.5. The most popular of these sports will have 12 and the others will have points depending on their numbers and the rule of 3. So, if the number of these sports is 57, the lowest will have:

$$(\text{less popular sport event} * 12) / 57 = (1*12) / 57 = 0.21$$

These points will then be multiplied by a coefficient based on the Gross Domestic Product (GDP) of each country. Every trillion of dollars gives one point for the GDP coefficient. Given that France's GDP is 2.58 trillion, France's GDP's coefficient will be of 2.58. Therefore, the most popular sport event in France would have 258 points. The multiplication of the points by a country's GDP coefficient was done because we consider that a sport that is popular in wealthy countries attracts more funding than a sport popular in developing countries and consequently, a "wealthy sport" will attract athletes that are more talented and thus have a higher level of competition.

The popularity points won by a sport event in each country are then added to have their total number of points in the world (see Table 9).

Table 9. Total number of popularity points for men football in the 2019 WRCES	
Countries	Popularity points for men football
France	258
Germany	367
Greece	20
Hungary	13.9
...	...
World	7042.887

Like for the universality coefficient, the total of the popularity coefficients of the different events of the same sport (men football and women football) or of the different disciplines (football, futsal, beach soccer) will not be superior to the popularity coefficient of the sport to which they belong (football). And since there are 112 sports included in the 2019 WRCES, the most popular sport event in the world (men football) will get a popularity coefficient of 112. This was done because we consider that the most popular sport will be the first among the 112 choices that present themselves to youth interested to make a career in professional sport. The popularity coefficient of the different sports (that is the one of their most popular sport event) will then be calculated in three steps (we took the example of basketball and football):

$$\begin{aligned}
 &1- (\text{Men basketball} * 112) / \text{men football total popularity points} \\
 &= (5537.56 * 112) / 7042.887 \\
 &= 88
 \end{aligned}$$

All the sports will get a **first coefficient (related to the media popularity of the sport)** based on this rule of three.

- 2- We will then see in how many countries this sport event is popular. This new amendment was done to avoid having a sport very popular in a limited number of wealthy countries (ex: American football) outweigh a sport that generates less money but is popular in a much higher number of countries (ex: volleyball). Here again the sport (football) that has one of his event present in the largest number of countries will get a coefficient of 112. The other will get a coefficient based on the rule of three:

$$\begin{aligned}
 &(\text{number of countries where men basketball is popular} * 112) / \text{number of countries where} \\
 &\text{men football is popular} \\
 &= (151 * 112) / 194 \\
 &= 87.18
 \end{aligned}$$

All the sports will get a **second coefficient (related to the number of countries where**

this sport is popular) based on this rule of three

- 3- The **final popularity coefficient** of each sport will be an average of the **first and second coefficient**. This is an example of the 5 most popular sports

The total coefficient of each sport will be the sum of its popularity and universality. In the following link, you will find the table related to all the coefficients (popularity, universality and total) of all the events (where there is a large difference between men and women), disciplines and sports.

How the countries are ranked?

The points won in every event after the coefficient multiplications would be computed by discipline and the points won in every discipline after the coefficient multiplications would be computed by sport. For example, in the year 2019, in the sport of aquatics, the USA won first position in swimming, fourth in diving, ninth in synchronized swimming, second in water polo, fourth in open water and 2nd in high diving. Table 10 shows the number of points the USA won in the different disciplines of aquatics.

Table 10. Points won by the USA in the different disciplines of Aquatics				
Disciplines	USA rank in each of the discipline	Points won by the USA considering its rank (PW)	Coefficient of each discipline (CD)	Points won by the USA after the coefficient multiplication PW*CD
Swimming	1 st	2060	36.85	$2060 * 36.85 = 75911$
Diving	4 th	1015	7.26	$1015 * 7.6 = 7368.9$
Synchronized swimming	9 th	198	0.8	$198 * 0.8 = 158.4$
Water Polo	2 nd	1640	8.2	$1640 * 8.2 = 13448$
Open Water	4 th	1015	1.02	$1015 * 1.02 = 1035.3$
High Diving	2 nd	1640	0.16	$1640 * 0.16 = 262.4$

To calculate the points won by the USA in aquatics, we will first do the sum of the points it won in each of the aquatics disciplines, as it is shown in Table 11.

Table 11. <i>Points won by the USA in Aquatics after summing up the points it won in the different aquatics disciplines</i>	
Swimming	75911
Diving	7368.9
Synchronized swimming	158.4
Water Polo	13448
Open Water	1035.3
High Diving	262.4
Aquatics	98184

Given that the USA got the highest amount of points in aquatics, it will be ranked number one in this sport. So, the total points that the USA will get from aquatics would be the points won from being ranked number one (2060) times aquatics total coefficient (37.35) for a total of 76941.

The points won by each country in each of the sports after the coefficients multiplications were added to obtain their total amount of points. The final ranking will be calculated according to the “summed” total amount of each country.

Competitions chosen

For the competitions chosen, the WRCES uses the official or most recognized (like boxrec for boxing) ranking prepared by the international federation of each sport. When a sport part of the Olympic program does not have an official world ranking, the results of the last world championships and the Olympics to date are used. When a non-Olympic sport does not have an official world ranking, the results of the last world championships are used.