

DOI: [https://doi.org/10.31392/UDU-nc.series15.2024.7\(180\).49](https://doi.org/10.31392/UDU-nc.series15.2024.7(180).49)  
UDC: 796.88.063:796.032.2.(443.61)XXXIII (045)

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## TRENDS IN THE COMPETITIVE PERFORMANCE OF THE WORLD'S STRONGEST WEIGHTLIFTERS BEFORE THE XXXIII OLYMPIC GAMES IN PARIS

*Background and Study Aim.* The article aims to study the trends in the competitive performance of the world's strongest weightlifters at the 2023 World Championship and to reveal the prospects for their further entry into the XXXIII Olympic Games in Paris.

*Material and Methods.* We analyzed the achievements of 200 weightlifters who participated in the 2023 World Championship and the number of countries they represented by studying the scientific literature, Internet resources, score sheets, pedagogical observations, and video recordings of competitions. All indicators of competitive performance and age characteristics were grouped according to the following principle: the top 10 weightlifters in each weight category, as well as the winners of the competition among men and women. All weightlifters were conditionally divided into three groups of weight categories: for men by group I (up to 55, 61, 67 and 73 kg); group II (up to 81, 89 and 96 kg); group III (up to 102, 109 and + 109 kg); for women by group I (up to 45, 49, 55, 59 kg); group II (up to 64, 71 and 76 kg) and group III (up to 81, 87 and + 87 kg).

*Results.* The article analyzes the competitive results of the world's 200 best weightlifters in all weight categories for men and women who participated in the competitions, their age characteristics at the competitions and the beginning of their first international starts, the pace of achievement of results in their sports career, the ratio of achievements in each competitive exercise, the level of realization of competitive attempts, as well as the level of international competition in each weight category. The prospects of individual talented athletes to get to the XXXIII Olympic Games were determined.

*Conclusions.* The effectiveness of the performances of the world's strongest weightlifters at the World Championship on the eve of the Olympic Games was shown based on the analysis of the competitive results of weightlifters of different sexes, the number of licenses obtained by athletes of these countries, world and Olympic records. The optimal age of achievement of the highest results by weightlifters, the age of the beginning of the sport for the winners of the competition, the pace of achievement of maximum results in a sports career, the ratio of achievements in each competitive exercise, the level of implementation of competitive attempts in the snatch and the clean and jerk, the level of international competition in each weight category for men and women were determined, the characteristics of the competitive performance of the most titled athletes of the world who participated in this championship were analyzed.

**Keywords:** realization of achievements, age and gender differences, weightlifters, indicators of competitive performance, trends in the prospects of athletes

**Тенденції змагальної діяльності найсильніших важкоатлетів світу напередодні ігор XXXIII Олімпіади в Парижі.** Мета. Вивчити тенденції змагальної діяльності найсильніших важкоатлетів світу на чемпіонаті світу 2023 року та визначити перспективи подальшого їх попадання на Ігри XXXIII Олімпіади.

Матеріал та методи. Шляхом вивчення наукової літератури, Інтернет ресурсів, протоколів змагань, педагогічних спостережень, відеозаписів змагань нами аналізувались досягнення 200 важкоатлетів на чемпіонаті світу 2023 року та кількість країн, які вони представляли. Усі показники змагальної діяльності та вікові характеристики групувались за таким принципом: у 10-ох кращих важкоатлетів у кожній ваговій категорії, а також окремо у призерів змагань серед чоловіків та жінок. Усі важкоатлети умовно були розділені на 3 групи вагових категорій: у чоловіків I група (до 55, 61, 67 і 73 кг); II група (до 81, 89 і 96 кг); III група (до 102, 109 і +109 кг); у жінок I група (до 45, 49, 55, 59 кг); II група (до 64, 71 і 76 кг) і III група (до 81, 87 і +87 кг). У дослідженнях використовувалась статистична програма Statistica 10.0 (StatSoft, USA).

Результати. Проаналізовано змагальні результати у 200 кращих важкоатлетів світу у всіх вагових категоріях у чоловіків та жінок, які брали участь у змаганнях, їх вікові характеристики та на початку перших міжнародних стартів, темпи досягнення результатів за всю спортивну кар'єру, окремо співвідношення досягнень між ривком та поштовхом у кожній ваговій категорії. Визначались перспективи окремих талановитих спортсменів на потрапляння на Ігри XXXIII Олімпіади.

Висновки. На засадах аналізу змагальних результатів важкоатлетів різної статі, кількості ліцензій, отриманих спортсменами цих країн для участі в Олімпіаді, показана ефективність виступів провідних важкоатлетів світу на чемпіонаті світу напередодні Олімпійських ігор. Встановлено оптимальний вік досягнення найвищих результатів важкоатлетами, вік початку занять видом спорту у призерів змагань, темпи досягнення максимальних результатів за спортивну кар'єру, окремо співвідношення досягнень у кожній змагальній вправі, проаналізовано характеристику змагальної діяльності найбільш титулованих спортсменів світу, які брали участь у даному чемпіонаті.

**Ключові слова:** динаміка результатів, реалізація досягнень, вікові та статеві відмінності, важкоатлети, показники змагальної діяльності, тенденції перспективності спортсменів.

**Introduction.** Weightlifting as an Olympic sport has always attracted the attention of specialists and scientists all over the world because of the high sports achievements of male and female weightlifters at international competitions [1, 2]. This also applies to the indicators of competitive performance of athletes of different sexes and groups of weight categories, especially at the largest world forum of the annual macrocycle – the World Licensing Championship [3, 4, 5]. Such competitive performance of weightlifters is always accompanied by a large number of high sports achievements with the indispensable establishment of world records [6, 7, 8]. The 2023 competition was no exception [9, 10]. A total of 354 male and 338 female weightlifters competed for medals in 10 weight categories. In addition, the world's strongest weightlifters also competed for Olympic licenses, which provide points to boost their rankings for selection to the 2024 Olympic Games in Paris [11, 12].

The problems of studying the competitive performance of highly qualified athletes at the main competitions of the annual macrocycle were studied by many specialists [13, 14]. Of course, the rate of achievement of maximum results by athletes and their realization is the main issue that the authors considered [15, 16].

*The hypothesis of the research.* The comprehensive analysis of the achievements of the strongest weightlifters in the world depending on gender differences will help many coaches and specialists to find hidden reserves for their improvement in future starts.

The *article aims* to study the trends in the competitive performance of the world's strongest weightlifters at the 2023 World Championship and to reveal the prospects for their further entry into the XXXIII Olympic Games in Paris.

#### **Materials and Methods**

*Participants.* The International Olympic Committee reduced the number of events in weightlifting from seven to five for participation in the 2024 Paris Olympic Games. For men, these categories are: up to 61, 73, 89, 102, and + 102 kg; and for women – up to 49, 59, 71, 81, + 81 kg. It should be remembered that each National Olympic Committee can declare only one athlete in one weight category, and the maximum number is only three for weightlifters of each sex.

We analyzed the competitive performance and age characteristics of the 10 best weightlifters of each event, and the total number of athletes was 200 people.

*Research Design.* Methods: Analysis of scientific literature, Internet resources, score sheets, pedagogical observations, video recordings of competitions, analysis and synthesis of age indicators, sports results; and methods of mathematical statistics. We analyzed the following indicators of competitive performance of weightlifters:

1. The number of countries participating in the 2023 World Championship.
2. The number of medals won by individual countries and athletes.
3. Sports results shown at these competitions and their dynamics.
4. Age of achievement of the highest results and age of the beginning of performances on the international arena of the winners of competitions among men and women.
5. The rate of increase of achievements in separate exercises and the level of realization of competitive approaches in the prize-winners of competitions by groups of weight categories.
6. The level of international competition of athletes in each weight category depending on gender differences.

*Statistical Analysis.* Since the sample sizes of the medalists of the 2023 World Championship among men and women in each weight category were not always large, we conditionally divided all weightlifters into three groups of weight categories: for men group I (up to 55, 61, 67 and 73 kg); group II (up to 81, 89 and 96 kg); group III (up to 102, 109 and + 109 kg); for women group I (up to 45, 49, 55, 59 kg); group II (up to 64, 71 and 76 kg) and group III (up to 81, 87 and + 87 kg). Non-parametric statistics were used in the research. The following statistical parameters were determined: arithmetic mean  $\bar{x}$ , standard deviation  $S$ . The statistical significance of the difference  $p$  between the results of men and women of weight categories I and II, II and III, as well as between men and women in each weight category I, II and III was determined using the Mann-Whitney U-criterion, as the most powerful among non-parametric for two independent samples. Statistica 10.0 (StatSoft, USA) applied statistical program was used.

*Ethical Approval.* The research was conducted in accordance with the principles of the Declaration of Helsinki of the World Medical Association referred to as "Ethical Principles for Medical Research Involving Human Subjects" (amended in October 2013).

**Results.** The competition results for the 2023 World Championship for men and women are summarized below. We show the total number of athletes allowed to compete in 10 weight categories: 354 athletes competed among men, and 338 athletes among women.

The analysis of the number of medals won by athletes at the 2023 World Championship shows that the most successful at these competitions for men were the national teams of the following countries: China (won 15.6 % of the total number of medals), Armenia (10 % of medals), Korea and Uzbekistan (7.8 % of medals each), Vietnam (6.7 % of medals) respectively. Only one bronze medal each was won by weightlifters from Turkmenistan, Latvia, and Macao (China). If the medals of weightlifters from China, Armenia, and Korea were expected, the medals of the representatives of Vietnam, Egypt, Iraq, and Venezuela were somewhat unexpected. The representatives of 24 countries won medals of the World Championship among male weightlifters.

*Weight category up to 55 kg. Men.* The 25-year-old weightlifter Lai Gia Thanh from Vietnam became the world champion in the double-event combined total of 269.0 kg. This is his best result after 14 international starts since his first appearance in 2016. The 22-year-old compatriot Ngo Son Dinh lost to the champion in the double-event combined total of 261.0 kg. This is also his best result since the start of his international appearances in 2017, with the athlete's gain of + 46 kg in the double-event combined total. The 22-year-old Natthawat Chomchuen from Thailand lost only 2 kg to him in the double-event combined total of 259 kg. This is his best result since the start of international starts in 2016, the athlete's gain in the combined total amounted to +48 kg.

*Weight category up to 61 kg (Olympic event).* The 30-year-old Olympic champion of Tokyo athlete Li Fabin (China) became the world champion in the double-event combined total of 308.0 kg. He showed 4 kg less than at the Olympic Games in Tokyo and 6 kg less than at the Asian Championship in the same year. He started his international competitions in 2011 and has more than 17 of them in his sporting career. He can still add 6-10 kg at the Olympics in Paris. Only 6 kilograms in the double-event combined total of 302.0 kg was lost to him by the 21-year-old athlete Massidda Sergio from Italy. This is the best result for his sports career, and he started international competitions 5 years ago (in 2017) in the weight category up to 50 kg. The gain in results for 21 international starts amounted to + 136 kg. The bronze medal in this weight category went to the 21-year-old Hongjie Ding from China – 301.0 kg, which is 4 kg less than he showed at the Asian Championship of the same year.

*Weight category up to 67 kg.* The 30-year-old Olympic champion of Tokyo Chen Lijun (China) became the World Champion of 2023 with the result in the double-event combined total of 333.0 kg. It should be noted that the athlete has already shown such a double-event combined total at the 2015 World Championship. The second place was set by the 34-year-old athlete Eko Yuli Irawan from Indonesia – 321.0 kg, he lost 12 kg to the champion. He started his international competitions 6 years ago (in 2006) and has more than 35 of them. The bronze medal went to the 20-year-old Gor Sahakyan from Armenia – 312.0 kg respectively, although the athlete showed a higher result in the double-event combined total of 320.0 kg at the 2023 European Championship.

*Weight category up to 73 kg (Olympic event).* The 19-year-old athlete Which Uma Weeraphone from Thailand became the 2023 World Champion with the maximum result in the double-event combined total of 349.0 kg. Taking into account the young age of the athlete and his short training experience, he has great prospects to add 10-12 kg to his total bodyweight score. Wei Yinting, the 25-year-old silver medalist of the championship from China, lifted 12 kg less – 337.0 kg. He started his international starts 9 years ago (in 2013), so the gain in the double-event combined total was + 60 kg. The bronze medalist of the championship the 22-year-old athlete Ozbek Muhammed from Turkey showed 3 kg less – 334.0 kg, although in 2022 he had the best result in the double-event combined total of 339 kg. He has high prospects of improving his results at the Olympic Games.

*Weight category up to 81 kg.* The 27-year-old athlete Reis Martinez Oscar from Italy became the World Champion in 2023 with the result in the double-event combined total of 356.0 kg. The 23-year-old athlete Abdullah Rahmat Erwin from Indonesia lost the silver medal and 2 kg to the champion totaling 354.0 kg. It should be noted that this unique athlete did not even take the prize-winning place in the snatch, but he realized all three approaches in the j clean and jerk and set a world record in the exercise. The bronze medal was won by the 22-year-old Muhammad Kadira Toshtemirov from Uzbekistan totaling 352.0 kg respectively. The first international competition for this athlete was 5 years ago (in 2017) in the weight category up to 69 kg.

*Weight category up to 89 kg (Olympic event).* The 23-year-old athlete Javadi Aliabadi from Iraq became the 2023 World Champion with the result in the double-event combined total of 384.0 kg. Taking into account his short experience of international starts and relative youth there are all prospects for increasing his achievements at the Olympic Games. The 25-year-old athlete Li Dayin from China lost only 1 kg to the champion totaling 383.0 kg. It should be noted that this athlete showed an outstanding result for himself at the Asian Championship of the same year – 396 kg. Taking into account the high efficiency of Chinese weightlifters



to show high results at the main competitions of the four years, this athlete has high prospects of winning a medal in the double-event combined total at the Olympic Games. The 24-year-old bronze medalist Vallenilla Sanchez from Venezuela showed only 2 kg less totaling 381.0 kg respectively. This athlete's first international start was 7 years ago (in 2015) in the weight category up to 85 kg.

*Weight category up to 96 kg.* The 27-year-old athlete Karim Abokahla from Egypt became the 2023 World Champion with the result in the double-event combined total of 387.0 kg. This is his best result for his sporting career. The 27-year-old athlete Won Jong-beom from Korea showed 3 kg less than the champion totaling 384.0 kg. This athlete began his international starts 6 years ago (in 2016), and the total gain in the double-event combined total for the years of preparation amounted to + 94 kg. Finally, the bronze medal went to the athlete from Iraq Al-Lami Qasim with the result in the total of 379.0 kg. It should be noted that the beginning of international starts for this athlete was 7 years ago (in 2015), but then he competed in the weight category up to 50 kg.

*Weight category up to 102 kg (Olympic event).* The 22-year-old athlete Liu Huanhua from China became the 2023 World Champion with the result in the double-event combined total of 404.0 kg. Given his short training experience and relatively young age, the athlete may add another 10-12 kg to his result by the time of the Olympic Games. The 26-year-old silver medalist of the World Championship Jang Yeon-hak from Korea lost only 5 kg to the champion totaling 399.0 kg. The bronze medal went to the 25-year-old Evgeny Tsikhantsov (competing as an athlete from a neutral country) with the result of 394.0 kg.

In our opinion, weightlifters of the following two weight categories have all prospects to compete for medals in + 102 kg Olympic event.

*Weight category up to 109 kg.* The 24-year-old Olympic champion Akbar Djuraev (Uzbekistan) from Tokyo became the World Champion of 2023 with the result in the double-event combined total of 415.0 kg (it is 15 kg less than at the Olympics in Tokyo). It should be noted that this athlete showed an outstanding result at the Islamic Solidarity Games in 2022 – 446 kg. Second place went to Ruslan Nurudinov from the same country with a total of 407.0 kg. This athlete already had an outstanding result for him at the World Championship in 2014 – 432.0 kg. The beginning of international starts for this athlete was 13 years ago (in 2009) in the weight category up to 85 kg. The 27-year-old Dadash Dadashbayli from Azerbaijan lost only 4 kg to the second prize winner totaling 403.0 kg respectively.

*Weight category + 109 kg.* The 30-year-old Olympic champion Lasha Talakhadze (Georgia) from Tokyo, a 197 cm tall athlete became the World Champion in 2023 with the result in the double-event combined total of 473.0 kg (15 kg less than at the Olympics in Tokyo). The 24-year-old athlete Varazdat Lalayan from Armenia showed 13 kg less and won the silver medal totaling 460.0 kg. The 29-year-old compatriot of V. Lalayan now playing for Bahrain Gor Minasyan showed 1 kg less and won the bronze medal totaling 459.0 kg respectively. These two World Championship medalists have high prospects to compete for medals at the 2024 Olympic Games.

The analysis of the number of medals won by athletes at the 2023 World Championship shows that the most successful women's teams at these events were those of the following countries: China (22.2 % of the total number of medals won), Colombia (13.3 % of medals won), Ecuador (11.1 % of medals won), and Korea (10.0 % of medals won), respectively. While the medals of Chinese and Korean athletes were planned, the medals of Colombia, Ecuador, Egypt, and Madagascar were somewhat unexpected. Among women medals of the World Championship were won by the representatives of 16 countries.

*Weight category up to 45 kg.* The 29-year-old athlete Pramongkhon Siriwimon from Thailand became the 2023 World Champion with the result in the double-event combined total of 179.0 kg. The silver medal was won by the 24-year-old athlete Rosina Randafiarison from Madagascar – 170.0 kg, and the bronze medal went to Kansu Bektas from Turkey – 162.0 kg respectively.

*Weight category up to 49 kg (Olympic event).* The 25-year-old athlete Jiang Huihua from China became the 2023 World Champion with the result in the double-event combined total of 215.0 kg. She also set two world records namely in the snatch (120.0 kg) and double-event combined total. This athlete has a long training experience, her first international start was 9 years ago (in 2013), and she took part in 16 international starts for her whole sports career, so the prospects for improving her results are high. Her compatriot, Tokyo Olympic champion Hu Jihai lost only 4 kg to the champion with the result in the double-event combined total of 211.0 kg. Of course, she will try to prove to everyone that she is the strongest at the Olympic Games in Paris. The bronze medal was won by the 25-year-old athlete Elizabeth Delacruz from the USA totaling 200.0 kg.

*Weight category up to 55 kg.* The 18-year-old athlete Chen Guan-ling from Taiwan became the 2023 World Champion with the result in the double-event combined total of 203.0 kg (it is 12 kg less than the World Champion in the previous weight category). The 24-year-old athlete Rohelys Galvis Gonzalez from Colombia lost only 2 kg to her totaling 201.0 kg, and the bronze medal and 4 kg less than the champion, was taken by Irene Borrego Gonzalez from Mexico totaling 199.0 kg.

*Weight category up to 59 kg (Olympic event).* The gold medal was won by Luo Shifang, the 22-year-old athlete from China, with the result in the double-event combined total of 243.0 kg. With a short training experience, this athlete has high prospects to increase her achievements at the Olympic Games in Paris. The 22-year-old athlete Kamila Konotop from Ukraine, lost to the champion with the double-event combined total of 236.0 kg. The bronze medal went to the 18-year-old Rei Hino from China – a compatriot of the world champion totaling 232.0 kg respectively.

*Weight category up to 64 kg.* The 24-year-old Natalia Llamasa Mosquera from Colombia became the 2023 World Champion with the double-event combined total of 223.0 kg. Having 10 years of experience in international competitions (24 starts), she had an increase in achievements of + 60 kg. However, her best result was shown in 2022 – 235 kg. The 23-year-old silver medalist Imoldeayo Ayodele from Nicaragua lost only 1 kg to the champion totaling 222.0 kg. The 27-year-old athlete Park Min Kyung from Korea lost 2 kg to the silver medalist with the result of 220.0 kg.

*Weight category up to 71 kg (Olympic event).* The 22-year-old athlete Liao

Guifang from China won the gold medal with the result in the double-event combined total of 273.0 kg. At the same time, she set 2 world records: in the snatch – 153.0 kg and in the double-event combined total. Having the 5th experience of starts at international competitions (since 2017), she was able to add + 76 kg to the double-event combined total. The athlete Paola Palacios Dájomes from Ecuador lost 18 kg to the champion with the result in the double-event combined total of 255.0 kg, and the bronze medal went to the 20-year-old athlete Olivia Lynn Reeves from the USA – 253.0 kg respectively. She started at international competitions in 2015, so she has added + 59 kg to her results.

*Weight category up to 76 kg.* The 25-year-old athlete Ahmed Sara Samir from Egypt became the 2023 World Champion with the result in the double-event combined total of 246.0 kg (27 kg less than the previous champion). However, in the same year at the Asian Championship, she was able to show an outstanding result for herself – 268 kg. Having 11 years of experience in international competitions and 27 starts, she added + 53 kg to her best result. The 24-year-old silver medalist of the competition Hellen Escobar Aguirre from Colombia showed 4 kg less totaling 242.0 kg. She has started 21 times in 8 years of international competitions, which allowed her to add + 62 kg in that time. The 21-year-old bronze medalist Nancy Paredes Arreaga from Ecuador has 2 kg less, and 240.0 kg respectively. She has had more than 19 international starts (since 2017), so the gain in achievements over the years is + 64 kg.

*Weight category up to 81 kg (Olympic event).* The 26-year-old athlete Liang Xiaomei from China became the 2023 World Champion with the result in the double-event combined total of 281.0 kg. At the same time, she set a new world record in the snatch – 159 kg. Having a short experience performing at international competitions for 6 years (since 2016), she has high prospects for increasing her achievements. The 29-year-old Wang Joyu lost only 4 kg to her compatriot totaling 277.0 kg. The bronze medal was won by the 24-year-old athlete Eileen Cikamatana from Australia – 256.0 kg.

In our opinion, female athletes of the next two weight categories have all the prospects to fight for medals in the Olympic event + 81 kg.

*Weight category up to 87 kg.* The 27-year-old athlete Luo Xiaomin from China became the 2023 World Champion with the result in the double-event combined total of 245 kg. This is the best result for her sports career. The 26-year-old athlete Yeinny Geles Moreno from Colombia lost only 1 kg to her with the result of 244 kg, although her best result was 249 kg at the Pan American Games in 2022. The bronze medal went to the 25-year-old Jun A-Ram from Korea with 241 kg respectively. All three athletes can add to their double-event combined totals, however, it is difficult for them to compete with the female athletes competing in the next weight category.

*Weight category + 87 kg.* The 20-year-old athlete Park Hye-jeong from Korea became the World Champion of 2023 with the result in the double-event combined total of 289.0 kg, although her best result was shown in the same year at the Asian Championship – 295.0 kg. The 33-year-old silver medalist Mary Theisen-Lappen from the USA lost 12 kg to her totaling 277.0 kg. The 25-year-old athlete Lisseth Ayoví Cabezas from Ecuador lost only 1 kg and took third place totaling 276.0 kg. Having 10 years of experience in international competitions and 44 starts, she got a + 66 kg gain in the double-event combined total. The number of international starts in her annual macrocycle is striking: she had eight starts in 2017 and six international starts each in 2018, 2019, and 2021.

The competitive performance of the weightlifters of the medalists of the 2023 World Men's Championship is presented below (Table 1).

**Table 1.** Competitive performance of the 2023 Men's World Championship medalists

Weight category, kg	Place	Age, years	International starts		
			Beginning, age	Number	Rate of PB achievement for this period, years
55	1	25	18	14	7
	2	22	17	4	6
	3	21	15	6	7
Mean		<b>23</b>	<b>17</b>	<b>8</b>	<b>7</b>
61	1	30	18	17	12
	2	21	15	21	6
	3	21	20	3	1
Mean		<b>24</b>	<b>18</b>	<b>14</b>	<b>6</b>
67	1	30	17	17	13
	2	34	17	35	7
	3	20	18	6	2
Mean		<b>28</b>	<b>17</b>	<b>19</b>	<b>7</b>
73	1	19	17	6	2
	2	25	15	3	10
	3	22	15	13	7
Mean		<b>22</b>	<b>16</b>	<b>7</b>	<b>6</b>
81	1	27	26	3	1
	2	23	15	20	6
	3	22	16	20	6
Mean		<b>24</b>	<b>19</b>	<b>14</b>	<b>4</b>

89	1	23	19	9	4
	2	25	20	11	5
	3	24	17	37	7
Mean		<b>24</b>	<b>19</b>	<b>19</b>	<b>5</b>
96	1	27	17	8	10
	2	27	18	5	7
	3	23	15	8	8
Mean		<b>26</b>	<b>17</b>	<b>7</b>	<b>8</b>
102	1	22	21	3	1
	2	26	19	14	7
	3	25	-	2	-
Mean		<b>24</b>	<b>20</b>	<b>6</b>	<b>4</b>
109	1	24	18	20	5
	2	32	18	23	5
	3	27	16	13	8
Mean		<b>26</b>	<b>17</b>	<b>19</b>	<b>6</b>
+109	1	30	22	16	8
	2	24	18	12	5
	3	29	16	4	8
Mean		<b>27</b>	<b>19</b>	<b>11</b>	<b>7</b>

Notes: Mean - arithmetical average; PB - personal best result.

The analysis of the data in Table 1 shows that the average age of the medalists of the 2023 World Championship among men ranges from 23 to 27 years old. Moreover, in this group of weightlifters, the youngest medalists of the World Championship were the 19-year-old Which Uma Weeraphone from Thailand, and the 20-year-old Gor Sahakyan from Armenia, and the oldest medalist of these competitions was the 34-year-old athlete Eko Yuli Irawan from Indonesia.

As for the age of beginning of performances of female weightlifters in international starts, here the fluctuations are much lower and make from 17 to 19 years old. In addition, surprisingly, 6 weightlifters (20.0 %) out of 30 prize-winners in competitions started such performances at the age of 15. The obtained data do not quite agree with the results of studies obtained by other authors earlier.

The number of international starts for world championship medalists during their entire sports career differs significantly for many athletes: from 2 to 35, but the most common athletes have from 14 to 19 such international competitions.

The rate of achievement of maximum results, shown in the shortest terms, characterizes the perspective and talent of this or that weightlifter. For the World Championship medalists, they vary on average from 4 to 7 years. However, the length of sports experience and the age of the weightlifter also matter here. At the same age of the athletes, the advantage is given to the one who has fewer years of practicing the sport (more prospects for further increase of achievements in the double-event combined total). At the same length of time practicing the sport, the athlete who is younger than his competitor has an advantage.

The results of the competitive performance of the medalists of the 2023 Women's World Championship are presented below (Table 2).

**Table 2.** Competition performance of the 2023 Women's World Championship medalists

Weight category, kg	Place	Age, years	International starts		
			Beginning, age	Their number	Rate of PB achievement for this period, years
45	1	29	28	3	1
	2	24	17	12	7
	3	20	16	10	4
Mean		<b>24</b>	<b>20</b>	<b>8</b>	<b>4</b>
49	1	25	15	16	10
	2	26	18	13	8
	3	25	17	21	8
Mean		<b>25</b>	<b>17</b>	<b>17</b>	<b>9</b>
55	1	18	17	4	1
	2	24	20	5	4
	3	22	14	5	8
Mean		<b>21</b>	<b>17</b>	<b>5</b>	<b>4</b>
59	1	22	16	5	6
	2	22	15	22	7
	3	18	17	3	1
Mean		<b>21</b>	<b>16</b>	<b>10</b>	<b>5</b>

64	1	24	16	24	8
	2	23	23	1	-
	3	27	15	8	12
Mean		<b>25</b>	<b>18</b>	<b>11</b>	<b>7</b>
71	1	22	16	6	6
	2	23	15	41	8
	3	20	12	12	8
Mean		<b>24</b>	<b>14</b>	<b>20</b>	<b>7</b>
76	1	25	14	27	8
	2	24	16	21	8
	3	21	15	19	6
Mean		<b>23</b>	<b>15</b>	<b>22</b>	<b>7</b>
81	1	26	19	4	7
	2	29	19	15	8
	3	24	20	10	4
Mean		<b>24</b>	<b>19</b>	<b>10</b>	<b>6</b>
87	1	27	15	18	12
	2	26	16	16	10
	3	25	20	2	5
Mean		<b>26</b>	<b>17</b>	<b>12</b>	<b>9</b>
+87	1	20	12	6	8
	2	33	30	5	3
	3	25	15	44	10
Mean		<b>26</b>	<b>19</b>	<b>18</b>	<b>7</b>

Notes: Mean - arithmetical average; PB - personal best result.

The analysis of the data in Table 5 shows that the average age of the medalists of the 2023 World Championship among women ranges from 20 to 24 years (which is on average 3 years less than that of men). Moreover, in this group of female weightlifters the youngest medalists of the World Championship were Chen Guan-ling from Taiwan and Rei Hino from China – both are 18-year-old respectively. The oldest medalist in these competitions was the 33-year-old athlete Mary Theisen-Lappen from the USA.

As for the age of athletes' performances in international starts, here the fluctuations range from 12 to 20 years old. Moreover, among the medalists of the World Championship, some female athletes started competing in international competitions at the age of 12-15 year old (36.7 % of all medalists in the competitions).

The data obtained indicate that the age of athletes in women's weightlifting who started their professional career is significantly decreasing.

The number of international starts of female world championship medalists during their sports career differs significantly for many female athletes: it ranges from 3 to 41, which is slightly more than for men. Most often, female athletes use from 10 to 20 starts during the period of preparation for international competitions.

The rate of achieving maximum results for women varies on average from 4 to 7 years, the same as for men. The length of training, the age of the female athletes, and their body type features all matter here. Other things being equal, the advantage at competitions is given to athletes whose body type is as close as possible to weightlifting: small height and short body links.

One of the components of competitive training of weightlifters is the rate of increase of achievements in competitive exercises: the snatch and the clean and jerk. The ratio of competitive results to each other (the snatch to the clean and jerk, taken as 100 %) allows coaches to determine which of the exercises lags in the training of athletes, and which has an advantage (Table 3).

**Table 3.** Ratio of competitive results for weightlifters-medal-winners of the 2023 World Championship (1–3 places) for men and women

Groups of weight categories	Results in ration of the snatch to the clean and jerk, %						Significance of the difference	
	Men			Women			U	p
	n	Mean	S	n	Mean	S		
Group I	12	82.5	1.9	12	80.6	1.3	0.8	≥0.05
Group II	9	81.0	2.9	9	80.5	1.0	0.2	≥0.05
Group III	9	83.7	2.1	9	77.5	1.6	1.6	≥0.01
Mean	30	82.4	2.3	30	79.9	1.3	0.9	≥0.01

Notes: Mean - arithmetical average; S - standard deviation; U - Mann-Whitney U-test value; p - statistical significance of the difference between the results of men and women in groups of weight categories.

The analysis of the data in Table 3 shows that the ratio of the snatch to the clean and jerk for men of different weight category groups is  $82.4 \pm 2.1$  % on average. Whereas for women this ratio is significantly lower by 3.1 % in the direction of the

clean and jerk share and makes  $79.3 \pm 1.4$  % ( $p \leq 0.001$ ). Significant differences in the results of the ratio were obtained between men and women in groups 1 and 3 – 2.0 and 6.2 % ( $p \leq 0.05$ ). In addition, in the group of men, significant differences were observed between groups 2 and 3 of weightlifters – 2.7 % ( $p \leq 0.05$ ). In the group of women, there were significant differences between the female athletes of groups 1 and 3 – 3.1 % and groups 2 and 3 – 2.4 % ( $p \leq 0.05$ ). For women, there was a steady tendency to increase the share of the clean and jerk with increasing groups of weight categories.

One of the important components of the stability of technical and tactical training of weightlifters is their ability to realize all three approaches in the snatch and the clean and jerk at competitions, as well as the ability of coaches to plan this realization during competitive performance. In our calculations, if the athlete realized three approaches in the exercise he received 100 % of realization, if two approaches – 66.0 %, if one approach – 33.0 % respectively.

The analysis of the data shows the same trend in the performance of weightlifters of different genders at the 2023 World Championship in the competition exercises. Men and women performed more consistently in the snatch than in the clean and jerk: 75.0 % vs. 65.0 % and 72.9 % vs. 69.6 %, respectively. The highest level of realization of competitive approaches is observed for men in the snatch in middleweight categories up to 81 and 96 kg – 100.0 and 89.0 % of realization, and in the clean and jerk – up to 81, 87, and 109 kg in middle and heavyweight categories – 89.0; 77.3 and 77.3 % respectively.

For women, the most stable performance in the snatch was shown by athletes in weight categories up to 45 and 49 kg (realization in small categories) – 100.0 and 77.7 %, and in the clean and jerk – up to 59 and 64 kg (realization in light and middleweight categories) – 88.7 % accordingly. The practice of training shows that weightlifters who have a high level of realization of competitive approaches in the snatch and the clean and jerk have high chances of improving their results at international competitions.

We also studied the level of international competition of weightlifters in each weight category at the 2023 World Championship.

The data analysis shows that male weightlifters had the highest competition at the World Championship in the weight categories up to 96, 102, 61, and 73 kg, with the difference between the results from the 1st to the 10th places – 5.0; 5.4; 5.6 and 6.6 %. Moreover, in the last two Olympic weight categories there were 90 and 70 % of identical results in the double-event combined total with a minimum difference of 1 kg or less. This trend indicates a high level of competition for men in these weight categories.

In female weightlifters, the highest competition is observed in such weight categories as up to 55, 64, 59, 55, and 87 kg respectively with the difference of results from the 1st to the 10th places – 7.4; 9.0; 9.5, and 10.2 %. In these weight categories, there was the greatest number of identical results with the difference between them in 1 and less kg – 60-70.0 %.

Thus, the highest level of international competition at the XXXIII Olympic Games in Paris can be expected for men in the Olympic events of 61 and 73 kg, as well as in the Olympic event of + 102 kg, where athletes from weight categories up to 109 and + 109 kg will try to get. For women, a similar trend is observed in the weight categories up to 59, 87, and + 87 kg. Here, too, the women of the last two weight categories of the World Championship will certainly qualify for medals of the Olympic Games in the Olympic event + 87 kg.

**Discussion.** The results of the competitive performance of the strongest weightlifters of different countries at the 2023 World Championship allow us to see several trends that can be taken into account by specialists for the effective preparation of athletes for international starts and the Games of the XXXIII Olympiad in Paris.

*First.* The geography in the group of medalists of competitions representing different countries has significantly expanded. There are more men than women (24 vs. 16), which indicates a higher level of international competition in the first group. If earlier, the prize-winning places at the World Championship were won by the representatives of the countries, which were among the ten strongest in the world, today they can be won by athletes of those countries, whose ranking in the list of the strongest countries is much lower. For example, for men these are athletes from Indonesia, Vietnam, Egypt, Iraq, or Venezuela, and for women – athletes from Colombia, Ecuador, Egypt, or Madagascar. The findings are consistent with the results of studies obtained by other authors earlier [17, 18].

*Second.* The intensity of competitive performance in the strongest weightlifters in the world has significantly increased. Today, for both men and women, the number of international starts reaches 6-8 in the annual macrocycle. The number of international starts of world championship medalists during their entire sports career has significantly increased, with men averaging from 14 to 19 and women from 10 to 20 starts. These data are not entirely consistent with the results of studies obtained by other authors earlier [2, 19].

*Third.* Many athletes who became prize-winners at the competitions have learned to bring their athletic form to the moment of the main starts of the annual macrocycle. Practice shows that more than 90.0 % of athletes achieve maximum results in the double-event combined total exactly at the main competitions of the annual macrocycle. These data are consistent with the results of studies obtained by other authors earlier [3, 6, 20].

*Fourth.* In some events of competitions, there were two medalists from one country, while according to the IOC requirement, only one athlete can compete from one country at the 2024 Olympic Games. For example, for men, the medalists of the 2023 World Championship were: in the weight category up to 55 kg – two weightlifters from Vietnam, up to 61 kg – two weightlifters from China, up to 109 kg – two weightlifters from Uzbekistan; for women, respectively – in the weight categories up to 49, 59 and 81 kg – two athletes from China. These data confirm the results of studies obtained by other authors earlier [1, 21].

*Fifth.* The average age of world championship medalists corresponds to the data of other authors: for men – 23-27 year old, for women – 20-24 yearold. As for the age of the beginning of athletes' performances in international starts, here the fluctuations are from 17 to 19 years for men, and from 12 to 20 years for women. Moreover, among the medalists of the World



Championship, some female athletes started competing in international competitions at the age of 12-15 years (36.7 % of all medalists). The obtained data indicate that the age of athletes in women's weightlifting who started their professional career is significantly decreasing, which is not always consistent with the data of other authors [11, 22].

*Sixth.* On the ratio of the achievements of the share of the snatch to the clean and jerk in the double-event combined total. For men at the 2023 World Championship, there is a tendency of a higher increase in the share of achievements in the snatch (especially in the third group) than in the clean and jerk, and for women, on the contrary, to a greater extent, due to a greater increase in the share of results in the clean and jerk, especially for athletes of the third group (82.4 % and 79.3 %, respectively). Earlier we studied this ratio in the medalists of the Games of the XXXIII Olympiad in Tokyo, and it was: on average  $82.0 \pm 2.2$  % for men and  $78.7 \pm 2.7$  % ( $p < 0.05$ ), which corresponds to the data obtained earlier [8, 23].

*Seventh.* The level of realization of approaches in the snatch is more than in the clean and jerk: for men 75.0 vs. 65.0 %, and for women 72.9 vs. 69.6 % respectively. The highest level of realization of competitive approaches is observed for men in the snatch in middleweight categories up to 81 and 96 kg – 100.0 and 89.0 % of realization, and in the clean and jerk – up to 81, 87, and 109 kg in middle and heavyweight categories – 89.0; 77.3 and 77.3 % respectively. For women, respectively, in the snatch in weight categories up to 45 and 49 kg – 100.0 and 77.7 %, and the clean and jerk – up to 59 and 64 kg – 88.7 % respectively. Practice shows that weightlifters who have a high level of realization of competitive approaches in the snatch and the clean and jerk have higher prospects for improving their results in international competitions [7, 20].

*Eighth.* The analysis of the level of international competition at the 2023 World Championship allowed us to predict a possible high level of competition at the Games of the XXXIII Olympiad in Paris: it can be expected for men in the Olympic events of 61 and 73 kg, as well as + 102 kg, where athletes from the weight categories up to 109 and + 109 kg will try to get. For women, a similar trend is observed in the Olympic events up to 59, 87, and + 87 kg. Here, too, women of the last two weight categories of the World Championship will certainly claim medals in the Olympic event + 87 kg. The experience of practice shows that the level of international competition varies considerably depending on the ranking of competitions. At the Olympic Games it is much higher than at other international competitions [9, 17].

### Conclusions

1. The number of medals of the 2023 World Championship shows the level of preparation of weightlifters of the leading national teams of the countries for the Games of the XXXIII Olympiad 2024 in Paris. The most successful for men were the national teams of China (9 gold, 4 silver, and 1 bronze medal), Uzbekistan (4, 2, 1 respectively), Vietnam (3, 3, 0), Georgia (3, 0, 1), Thailand (2, 1, 3), Egypt (2, 1, 1). For women, respectively: China (12, 6, 2), Taiwan (5, 1, 0), Korea (4, 2, 3), Egypt (3, 0, 1), Thailand (3, 0, 0), Colombia (2, 8, 2). It is surprising for the recent significant progress of weightlifters in such countries as Egypt, Vietnam, Thailand, and Colombia, where recently there were no medalists at the world Championship.

2. The average age of the medalists at the 2023 World Men's Championship ranges from 23 to 27 years old. The youngest medalists of the World Championship were the 19-year-old Which Uma Weeraphone from Thailand and the 20-year-old Gor Sahakyan from Armenia, and the oldest medalist of these competitions was the 34-year-old Eko Yuli Irawan from Indonesia.

The average age of female medalists ranges from 20 to 24 years (which is on average 3 years less than that of men). The youngest medalists of the World Championship were Chen Guan-ling from Taiwan and Rei Hino from China – both 18-year-old respectively. The oldest medalist in these competitions was the 33-year-old athlete Mary Theisen-Lappen from the USA.

3. The average age of the beginning of performances at international competitions for men is 17 to 19 years old. Moreover, 6 weightlifters (20.0 %) out of 30 medalists started such performances at the age of 15. The number of international starts for the medalists of the World Championship during the whole period of preparation differs significantly for many athletes and ranges from 2 to 35 times. However, most often athletes use from 14 to 19 international starts in their preparation.

For women, it ranges from 12 to 20. Moreover, among the medalists of the World Championship, some started to compete in international competitions at the age of 12-15 years (36.7 % of all medalists). The obtained data indicate that the age of athletes in women's weightlifting is significantly decreasing. The number of international starts for women ranges from 3 to 41, which is slightly more than for men, and the most frequent starts for female athletes are from 10 to 20 times in international competitions.

4. For men's and women's world championship medalists, the rate of achieving maximum results from the beginning of international starts is on average 4-7 years. The years of training (years of experience), the age of the athletes, and their body type are also important here. More talented athletes take less time to reach their maximum results.

5. The ratio of achievements of the snatch to the clean and jerk in high-skill weightlifters should correspond to the model characteristics: for men – 82-84 %, and for women – 78-81 %.

Such a ratio of achievements of the share of the snatch to the clean and jerk was obtained for men of different groups of weight categories and at the 2023 World Championship –  $82.4 \pm 2.3$  %, and for women –  $79.9 \pm 1.2$  %. Consequently, for men, the increase in the share of results in competitive exercises is proportional in both the snatch and the clean and jerk, and for women, on the contrary, to a greater extent due to an increase in the share of results in the jerk.

6. Realization of competitive approaches at the 2023 World Championship in competitive exercises characterizes the level of technical and tactical training of weightlifters. Men and women performed more consistently in the snatch than in the jerk: 75.0 vs. 65.0 % and 72.9 vs. 69.6 %, respectively. The highest level of realization of competitive approaches is observed for men in the snatch in middleweight categories up to 81 and 96 kg – 100.0 and 89.0 % of realization, and in the clean and jerk – up to 81, 87, and 109 kg in middle and heavyweight categories – 89.0; 77.3 and 77.3 % respectively.

For women, the most stable performance in the snatch was shown by athletes in weight categories up to 45 and 49 kg – 100.0 and 77.7 %, and in the clean and jerk in light and middleweight categories up to 59 and 64 kg – 88.7 % each accordingly.

Practice shows that weightlifters who have a high level of realization of competitive approaches in the snatch and the clean and jerk have high chances of improving their results at international competitions.

7. The density of identical results in a given event indicates the level of international competition at these competitions. The highest density of competition results for male weightlifters at the World Championship was in the weight categories up to 96, 102, 61, and 73 kg, with the difference between the results from the 1st to the 10th places – 5.0; 5.4; 5.6 and 6.6 %. Moreover, in the last two Olympic weight categories there were 90 and 70 % of identical results in the double-event combined total with a minimum difference of 1 kg or less.

The highest density of competitive results for female weightlifters is observed in such weight categories as up to 55, 64, 59, 55, and 87 kg respectively with the difference of results from the 1st to the 10th places – 7.4; 9.0; 9.5, and 10.2 %. These categories had the highest number of identical results with a difference between them of 1 and less kg – 60-70.0 %.

**Acknowledgement.** The authors would like to thank all participants involved in this research for their time and effort.

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DOI: [https://doi.org/10.31392/UDU-nc.series15.2024.7\(180\).50](https://doi.org/10.31392/UDU-nc.series15.2024.7(180).50)

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#### INFORMATION TECHNOLOGIES IN THE LIFE OF STUDENTS AS ONE OF THE KEY ASPECTS OF TRAINING IN EDUCATION

*The most important elements of the electronic part of the world information space are professional databases, business Internet resources, and electronic libraries. The increasing role of the information product as a trend in the development of the information society determines the need for processing ever-increasing volumes of information, the need for various forms of information perception, as well as the need for the relevance and accuracy of information. A modern specialist must be able to: identify information needs to solve a specific problem; use information resources taking into account existing legislative and ethical standards; gain access to information resources; give a professional assessment of information; use information found in world resources when solving professional problems. The widespread development of information technologies and their penetration into spheres of social life has determined global development over the past few decades. This process requires training a sufficient number of qualified specialists, as well as increasing the general level of computer literacy. This requires improvement and structural changes in the education system, as well as provision of modern material and technical equipment for the educational process. The ability to find the necessary information and use it in one's activity is a mandatory requirement for specialist of any profile. The article reveals the role of information technologies in the education of university students. Advancement towards an information society requires the use of innovative teaching methods that will allow students to learn at a pace that suits them and at a level that matches their abilities.*

**Key words:** university, students, learning, information technologies, progress.

**Зеніна Ірина, Гаєрилова Надія. Інформаційні технології в житті студентів як один з ключових аспектів підготовки в навчанні.** Найважливішими елементами електронної частини світового інформаційного простору є професійні бази даних, ділові Інтернет-ресурси, електронні бібліотеки. Зростання ролі інформаційного продукту як тенденції розвитку інформаційного суспільства визначає потребу в обробці постійно зростаючих обсягів інформації, потребу в різноманітних формах сприйняття інформації, а також потребу в актуальності та точності інформації. Сучасний фахівець повинен вміти: визначати інформаційні потреби для вирішення конкретної проблеми; використовувати інформаційні ресурси з урахуванням існуючих законодавчих та етичних стандартів; отримати доступ до інформаційних ресурсів; давати професійну оцінку інформації; використовувати інформацію зі світових ресурсів при вирішенні професійних завдань. Широкий розвиток інформаційних технологій та їх проникнення у сфери суспільного життя визначило глобальний розвиток останніх кількох десятиліть. Цей процес потребує підготовки достатньої кількості кваліфікованих спеціалістів, а також підвищення загального рівня комп'ютерної грамотності. Це потребує вдосконалення та структурних змін у системі освіти, а також забезпечення сучасним матеріально-технічним оснащенням навчального процесу. Уміння знаходити необхідну інформацію та використовувати її у своїй діяльності є обов'язковою вимогою до спеціаліста будь-якого профілю. У статті розкривається роль інформаційних технологій у навчанні студентів ВНЗ. Просування до інформаційного суспільства вимагає використання інноваційних методів навчання, які дозволять учням навчатися в зручному для них темпі та на рівні, який відповідає їхнім здібностям.

**Ключові слова:** університет, студенти, навчання, інформаційні технології, прогрес.

**Formulation of the problem.** In today's world, where the development of digital technologies is gaining more and more importance, education cannot be left behind. The use of digital technologies in education has already become an integral part of