

AGE DISTRIBUTION OF WRESTLERS PARTICIPATING IN THE WORLD CHAMPIONSHIPS**Mykola Latyshev¹, Victor Shandrygos², Yrui Tropin³, Olena Polianycho¹, Alfiia Deineko⁴,
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DOI. 10.51371/issn.1840-2976.2021.15.1.17

Original scientific paper

Abstract

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

Keywords: *wrestling, age peak, rank, weight group.***Introduction**

Modern training of athletes is impossible without forecasting, justified by scientific research. The forecasting is aimed at designing, planning and creating of probable ways of development and means to achieve long-term goals (Stein et al., 2017; Wunderlich & Memmert, 2020). The data on the relationship between the age and the competitive result are important for planning a long-term development of athletes in each sport (Bompa & Haff, 2009). The aging process is a key factor of an athlete's physical and mental development, which in turn plays a critical role in determining their competitive performance (Allen & Hopkins, 2015). The most important age is the peak of competitive performance, on the basis of which the entire sports career in each sport is planned. As it is shown in studies, depending on the sport and gender of the athlete the age of peak competitive performance varies considerably (Bruce, Farrow & Raynor, 2013; Allen & Hopkins 2015).

A number of research works have been carried out in various sports: athletics (Tilinger, Kovar & Hlavatá, 2005; Haugen et al., 2018), swimming (Allen, Vandenbogaerde & Hopkins, 2014), cycling (Ratel, Bedu, Hennegrave, Dore & Duche, 2002; Zingg, Knechtle, Rüst, Rosemann & Lepers, 2013), weightlifting (Solberg, Hopkins, Paulsen & Haugen, 2019), gymnastics (Jelaska, Kalinski & Crnjak 2017), sports games (Palao, Gutiérrez & Frideres, 2008; Al Haddad, Simpson, Buchheit, Di Salvo & Mendez-Villanueva, 2015) and others. According to the research materials, in combat sports, the age of peak sports performance is accounted for by 24-26 years (Biac, Hrvoje & Sprem 2014; Franchini, Fukuda, & Lopes-Silva, 2020). However, in most works only the winners of the competitions are considered. Runners-up and athletes who did not take prizes are not considered at all. Also, the latest changes in the rules of wrestling competitions have adjusted the number of weight classes at international official competitions: six weight classes at the Olympic Games and ten at the world and

continental championships (Woodroffe, Donnenwerth & Peterson, 2016; unitedworldwrestling.org, 2020). The data analysis of modern athletes of different weight classes, medalists and athletes who did not take prizes enables more detailed forecasting of sports results in wrestling. This data will also help to optimize the training process of athletes.

The aim of the study – to determine the age indicators of the wrestlers who participated in the World Championships, depending on the place taken and the weight group.

Methods

The following research methods have been used in the paper: the analysis of the scientific and methodological literature, the analysis of the official result cards, methods of mathematical statistics.

We have studied the sports careers of the freestyle and Greko-Roman male wrestlers from 1st to 8th ranks who participated in the World Championships 2017, 2018 and 2019. 332 international sporting biographies of wrestlers have been analyzed. The data of the results has been taken from the official site of the “United World Wrestling” (unitedworldwrestling.org, 2020).

In the given paper the following indicators for groups of athletes are analyzed:

- The average age of the World Championships participants: the average age of the athletes of the World Championships at the time of participation.
- The average age of international career start at the senior level: the average age of the first participation in the international senior competitions (the Continental Championships, the World Championships, the Olympic Games).
- The average age of first success in international career at the senior level: the average age of the first success in the international senior competitions

(took from 1st to 3rd places at the Continental Championships, the World Championships, the Olympic Games).

- The proportion of athletes who achieved success at the junior level: the percentage of athletes who achieved junior success (took from 1st to 3rd places at the Junior Continental Championships or at the Junior World Championships.)

The age of wrestlers was calculated as the date of competition minus date of birth. Standard deviation calculations were performed where necessary. For a more detailed analysis of the distribution of age of peak performance, the results were presented on a scatter plot: the dependence of the average wrestlers’ place taken on the age at the time of participation in the competition. Additionally, a quadratic curve was drawn based on the results obtained (Haugen, Solberg, Foster, Morán-Navarro, Breitschädel & Hopkins, 2018).

All the weight classes have been arranged into three groups: the lightweight group (up to 66 kg inclusive); the middleweight group (67-86 kg); the heavyweight group (more than 86 kg).

The division into “Olympic” and “non-Olympic” weight groups was considered separately. The runners-up of the Olympic weight groups at the World Championship 2019 were licensed to participate in the Olympic Games.

Methods of the descriptive statistics have been used in the paper. To work with data (sorting, grouping, mathematical analysis, visualization), we used the programming language Python 3.9 (libraries NumPy, Pandas, Seaborn).

Results

Table 1 shows the age indicators of medalists, non-medalists and wrestlers in general at the World Championships.

Table 1. Age indicators of the World Championships participants depending on the place taken.

Indicators	Athletes’ Rank		
	Medalist (1-3 places)	Non- medalist (5-8 places)	All (1-8 places)
Age of the World Championships participants	26.3 ± 3.4	26.7 ± 3.8	26.5 ± 3.6
Age of the international career start at senior level	22.5 ± 2.6	23.0 ± 3.0	22.8 ± 2.8
Age of the first success in international career at senior level	23.1 ± 3.1	23.6 ± 3.3	23.4 ± 3.2
Proportion of athletes who achieved success at junior level	53.4 %	38.2 %	43.1 %

The average age of wrestlers is 26.5 years: medalists are slightly younger – 26.3 years, and non-medalists are older than 26.7 years. Medalists also have lower indicators of the career start and

success achievement age than non-medalists. More than half (53.4%) of medalists achieved success being at the junior level, while for non-medalists

this index is only 38.2%. The age range of athletes is from 19 to 35 years old.

For a more detailed analysis of the relationship between the age and the place taken, a scatter plot

has been made. The horizontal axis shows the age of athletes at the time of participation in the competition while vertical the axis shows their average rank (Figure 1).

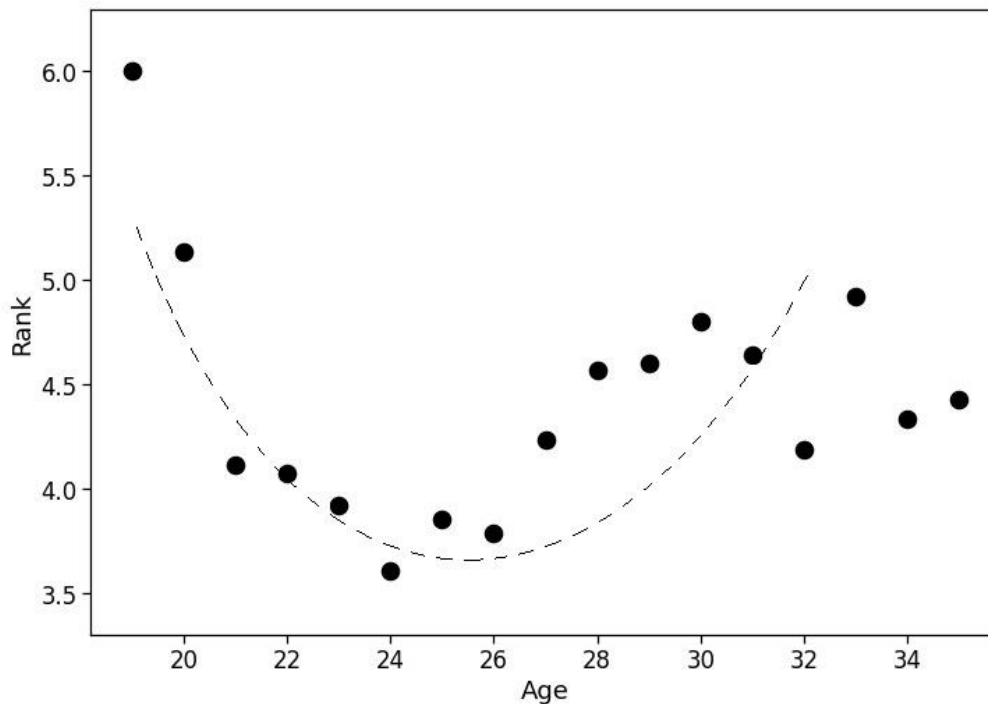


Figure 1. The scatter plot of the average wrestlers' place taken at the World Championships depending on the age.

The scatter plot clearly demonstrates the age of the peak performance of wrestlers: from 24 to 26 years. But it is worth noting that the quadratic curve does not accurately describe the indicated dependence.

The analysis of the distribution of the age of peak competitive performance of athletes-winners has shown the following results: at the age from 22 to 28 years' old there are 82.5% of the winners, from 22 to 26 years old – 63.2% of the winners, up to 23 years – 12.3% and there are only 15.8% of winners among those who are older than 28 years. As for the medalists, the results are the following: there are 67.7 % of medalist among the athletes who are 22-28 years old, 11.8% among those who are younger than 23 years old and only 26.6% among those who are older than 28 years. For athletes who did not take prizes (non-medalists), the distribution looks like this: there are 57.2 % of the athletes from 22 to 28 years old, up to 23 years – 16.8% and only 32.3% among those who are older than 28 years.

The results of winners show that on average, the winners are younger. The average age gradually increases with the place taken from 25.8 years (the 1st place) to 27.0 years (the 8th place).

Comparing the distribution of the results of winners, medalists and non-medalists, it can be noted that the age of winners and medalists is more densely grouped around the average. Also, it should be pointed out that more than a quarter of non-medalist wrestlers (23.1%) are in the age range from 19 to 23 years old. They are promising wrestlers among the non-medalists. In addition, there are more than a third of non-medalist athletes at the age of 29 and older (32.3%). Mostly they are athletes who previously achieved success and continue their careers, but cannot achieve success. Table 2 presents the data on the age indicators of athletes depending on the weight groups.

Table 2. Age indicators of the World Championships participants, depending on the weight group.

Indicators	Weight group		
	Lightweight	Middleweight	Heavyweight
Age of the World Championships participants	25.9 ± 3.7	26.6 ± 3.6	27.2 ± 3.6
Age of the international career start at senior level	22.7 ± 2.7	22.7 ± 2.9	22.9 ± 2.9
Age of the first success in international career at senior level	24.0 ± 3.0	23.9 ± 3.1	24.3 ± 3.3
Proportion of athletes who achieved success at junior level	44.6 %	43.7%	43.6 %

Analyzing the data presented in the table, it can be seen that there is a certain relationship between the average age at the time of participation in the competition and the weight of the athlete: the greater the weight of the athlete is, the older he is. The difference between the lightweight and the heavyweight athletes is more than one year. The linear regression coefficient between the age and the weight of athletes is positive and is equal to 0.47 kg per year.

At the same time, as for the indicators of the career start and the first success, there is almost no

difference in age between the lightweight and the middleweight athletes, whereas the wrestlers in heavyweight group are slightly older. The age of the international senior career start ranges from 22.7 to 22.9 years; while the age of

first success in international career at senior level varies between 23.9 and 24.3 years.

Table 3 displays the data on the age indicators of athletes of "Olympic" and "non-Olympic" weight classes at the World Championships 2019.

Table 3. Age indicators of the World Championships 2019 participants of the "Olympic" and "non-Olympic" weight classes.

Indicators	Weight classes	
	"Olympic" weight classes	"Non-Olympic" weight classes
Age of the World Championships 2019 participants	25.8 ± 3.2	25.9 ± 3.8
Age of the international career start at senior level	22.5 ± 2.6	22.9 ± 3.1
Age of the first success in international career at senior level	23.3 ± 2.9	23.9 ± 3.2
Proportion of athletes who achieved success at junior level	45.8%	43.8%

The age of the participants is almost the same for the "Olympic" (25.8 years) and "non-Olympic" (25.9 years) weight classes. At the same time, the age of international career start at the senior level and the age of first success in international career at the senior level of the participants of the "Olympic" weight classes are lower, that specifies their higher level. Likewise, the higher level of wrestlers of "Olympic" weight classes is confirmed by the proportion of athletes who achieved success at the junior level – 45.8% versus 43.8% among wrestlers of "non-Olympic" weight classes.

Discussion

The age of peak competitive performance is of high importance for planning and forecasting a long-term development of athletes. Considering different sports, it should be stressed that the age of peak competitive performance depends significantly on the kind of sport. For strength sports it is the following: the observed peak age of 26 ± 3 years of world-class weightlifters is in line with elite athletic

contestants (Solberg, Hopkins, Paulsen & Haugen, 2019). Estimates showed a peak age of 27 years for throwing events in athletics (Tilinger, Kovar & Hlavatá, 2005). In endurance events, estimates of peak age increased markedly with increasing event duration for both sexes, ranging from 21-23 years for swimming events (2–15 min) to 32-38 years for ultra-distance cycling (27–29 h) (Allen & Hopkins, 2015).

According to the results of the conducted analysis, the age of peak competitive performance of the World Championships medalists is 22-26 years (more than 60% of the medalists). The average age of the winners is 25.8 years; medalists – 26.3 years. These data confirm the previously obtained data for wrestlers (the age of peak competitive performance accounts for 24-26 years): the age of Greco-Roman wrestlers – the winners of the European Championships (from 2002 to 2012) is 24.9 years (Biac, Hrvoje & Sprem, 2014); the age of the Olympic champions and the World champions in Greco-Roman wrestling (from 2002 to 2015) is 25.6 years (Karninčić, Baić & Sprem, 2017); the

age of the Olympic champions in freestyle wrestling (from 1996 to 2016) is 25.5 years (Latyshev et al., 2020). The data obtained for medalist-wrestlers is similar to the results for strength sports discussed above.

The studies that were carried out confirm the previously obtained data about the age of peak performance in wrestling. Consequently, at the present stage, there is no evidence of successful athletes becoming younger. At the same time, the non-medalists do not have a distinct peak of age and there are more than 32% of non-medalist wrestlers who are older than 29 years old. The evidence about the non-medalist is not found, that is why it is considered to be relevant information. Unfortunately, the data obtained show that the period for achieving the peak competitive performance is limited and quite a few athletes can succeed beyond a certain period of age.

At the same time, from our point of view, the quadratic curve does not describe the distribution of the age of peak performance of wrestlers. This function is more complex and does not fully confirm the data obtained for other sports (Haugen, Solberg, Foster, Morán-Navarro, Breitschädel & Hopkins, 2018).

The age of international career start at the senior level is 22-23 years old for all wrestlers. However, the wrestlers-medalists, on average, achieve success by the age of 23, and non-medalists – by the age of 24. Based on the analysis, the following thesis can be formulated: in general, promising athletes should start an international career at 20-22 years old, show their first success at the age of 23-24 years and reach the peak, which lasts up to 28-29 years. However, it is worth noticing that for talented wrestlers, achievements in the international arena are possible even after 30 years, but the beginning of the performances and first success still are within the same limits.

The works of the authors (Albuquerque et al., 2013; Kirk, 2018) point out the existing correlation between the age of peak competitive performance and the weight class: the wrestlers of lightweight classes reach the peak competitive performance earlier. Our work has also proved this pattern and has shown that the linear regression coefficient between the age and the weight of athletes is positive and is equal to 0.47 kg per year.

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In wrestling, the World Championship 2019 is the main competition of the year, as it licenses for the Olympic Games. Athletes who won prizes in the "Olympic" weight classes are licensed to participate in the Olympic Games (www.teamusa.org, 2019). The issue of division of weight classes is relevant in other combat sports too (Jennings & Velázquez, 2015).

The analysis of the indicators of the wrestlers of the "Olympic" and "non-Olympic" weight classes revealed that the wrestlers of the "Olympic" weight classes are more titled – they achieve success earlier and the proportion of athletes who achieved success at the junior level is greater.

Conclusion

The analysis of the indicators of the participants of the World Wrestling Championships has been carried out. The average age of the wrestlers is 26.5 years: the medalists are slightly younger – 26.3 years, and non-medalists are older than 26.7 years. The analysis of the distribution of the age of peak competitive performance of athletes-medalists has shown the following results: there are 67.7 % of medalist among the athletes who are 22-28 years old, 11.8% among those who are younger than 23 years old and only 26.6% among those who are older than 28 years. At the same time, the non-medalists do not have a distinct peak of age and there are more than 32% of non-medalist wrestlers who are older than 29 years old. Comparative analysis of the distribution of the results of medalists and non-medalists has demonstrated that the age of medalists is more densely grouped around the average. More than half (53.4%) of medalists achieved success being juniors, while for non-medalists this proportion is only 38.2%.

Finally, the relationship between the age of peak competitive performance and the weight class has also been confirmed: the lightweight wrestlers reach the peak of competitive performance earlier. The linear regression coefficient between the age and the weight of athletes is positive and is equal to 0.47 kg per year.

Conflicts of interest

No potential conflict of interest was reported by the authors.

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Received:24.03.2021.

Accepted:11.05.2021.

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