Scientific-Expert Journal of Anthropological Aspects of Sports, Physical Education and Recreation

Submitted: 11/03/2024
Accepted: 17/04/2024
Published: 29/04/2024
UDK: 796.412.012:797.217.012

Original article

How old are Elite Olympic swimmers?

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Abstract

The primary aim of this research is to determine the age of best Olympic swimmers. Secondary aim is to determine the qualitative and quantitative data's considering the current age in relation to the criteria of winners, medalists, and non-medal finalists at the last three Olympics (London 2012, Rio 2016 and Tokyo 2021) considering gender, distance and stroke. In summary, the average age of all finalists in men was 24.1 ± 3.6 years, with the level of the range from 20.5 to 27.6 years, while in women it was 23.0 ± 3.7, with a range of 19.3 to 26.7 years, and the age of elite Olympic male and female swimmers is statistically significantly different. Also, it was found that sprinters are statistically significantly older, regardless of gender, while no difference was found between middle- and long-distance swimmers. Among the medalists, sprinters are the oldest, regardless of gender, which is mostly observed for the distance of 50m freestyle (men 27.9±2.8, women 26.1±1.6 years). In relation to different techniques, among male swimmers, breaststroke swimmers are the oldest (25.0 years), while freestyle swimmers are the oldest among female swimmers (23.2 years). The results of the regression equations showed that the average age of swimmers at the next Olympic Games in Paris in 2024 will be 24.3 years, but that the average age of female swimmers will be 24.2 years (almost equal to male swimmers). In general, it could be concluded that there is a slight tendency for top female Olympic swimmers to get older, while this tendency has not been established for male swimmers.

Keywords: Olympic athletes, swimmers, age of athletes

Citation: Šiljeg, K., Pessôa Filho, M.D., Dopsaj, M. (2024). How old are Elite Olympic swimmers? *SportLogia. 20(*1), 28-37. doi: 10.7251/SGIA2420028S

Introduction

Sport, as an integral part of human society, has its own stages and trends of development, which are specific for each sport or historical period of human civilization (Lonh, 2021). Top sports results could be usually achieved in a period that is biologically recognized as the period of youth or youth adult stage of life (Allen & Hopkins, 2015). The phenomenology of the career of top athletes, including the continuous monitoring and determination of the characteristics of the relationship between age and the potential for achieving top sports results, has been done in different sports, especially in individual (Gorzi et al., 2022).

Swimming is a historically important skill that man had to dominate in the ontogenetic aspect at the practical level. In other words, he had to master the skills of learning to swim. This is probably the most important reason why swimming has always had a significant social and educational role in human history, so it has been recognized as one of the sports that has been on the program of the modern Olympic Games since the very beginning i.e. from Athens 1986 (Lohn, 2021).

Sports experience and knowledge of the age at which elite swimmers achieve peak performance is very important for of the training process in terms of the organization multi-year planning and programming. This information is essential for the creation of long-term athlete development programs, for the selection of fundamentally important annual periods, and for the strategic decisions regarding the organization of preparation and competition phases. Also, the given data on the swimming peak performance age are important for the needs of career management in terms of planning the distribution of material and financial resources, as well as for the organization of the entire training technology system of a particular club or national association. Generally speaking, a complete phasing of the phenomenology of the relationship between the age of a top swimmer and his/hers maximum competitive performance as a function of technique and/or swimming race should be useful for monitoring the athlete's potential, result progression, stage level of achievement and identification of talents.

Identification of the optimal age of swimmers for achieving top results as a function of gender, competitive level, variability in race distance and stroke, represents a legitimate and current area of research in swimming science (Mallett et al., 2021; Dopsaj et al., 2023). Age, as a general chronological data, remains the most available data of all athlete characteristics, reflecting and supporting availability for their contribution to the prediction of competitive performance.

The primary aim of this paper is to determine the current data on the age of best Olympic swimmers i.e. Olympic finalists, as a category of top best swimmers. Secondary aim is to determine the qualitative and quantitative data's considering the current age in relation to the strata of winners, medallists, and generally finalists at the last three Olympics (London 2012, Rio 2016 and Tokyo 2021) as a function of gender, swimming distance and swimming technique. The obtained findings could help sports scientists, swimming researchers, coaches, and swimmers themselves with new information and a new perspective on the optimal age of Olympic-class swimmers.

Methods

Experimental approach to the problem

This research was carried out using a non-experimental method, and it belongs to the category of fundamentally oriented research.

Measurements and Procedures

The paper examines the ages of swimmers participating in the finale races (Males = 41 races, Females = 40 races) in the last three Olympic Games (OG): London 2012, Rio 2016 and Tokyo 2021. All results are collected from two databases: Swimrankings (https://www.swimrankings.net/) and World Aquatics (https://www.worldaquatics.com/).

Variables

The main variable used in this research was the athlete's age, expressed in years. This variable was analysed in relation to the criteria of gender, swimming technique, swimming race (i.e. distance), and in relation to the Olympic Games (London 2012, Rio 2016, and Tokyo 2021). Swimming disciplines were analysed in quantitative (absolute) aspect, but also in relation to qualitative aspect (sprint distances - 50 and 100m, middle distance - all 200 and 400 for freestyle; long distances - 800, 1500 and 400 medley). Also, the results were analysed from the aspect of success: Finalists (all swimmers participating in the final races); Medallists (all swimmers who won medals - first three places in the race); Non-medallists (swimmers placed in the final from 4 to 8 places); Gold (all first-place swimmers in the final); Silver (all second-place swimmers in the final); and Bronze (all third-place swimmers in the final).

Statistical analyses

Descriptive statistics were used to determine the basic measures of central tendency (Mean) and measures of dispersion (SD, CV%, Min and Max value, Standard error of mean – S.E.M, absolute and relative value). Differences between ages in relation to gender, technique, discipline, as well as in relation to the Olympic Games were determined by applying MANOVA. The difference between pairs of variables was determined using the ANOVA, and t test with the use of Bonfferoni correction. Effect size (Eta^2) and sample power was calculated, too. Linear regression analysis was used to define the trend of age change as a function of the analysed Olympiads. All analyses were performed by the statistical package SPSS 23.0 (IBM, SPSS statistics, version 23), while the level of statistical probability was set to a p value of 0.05.

Results

Table 1 shows the basic descriptive data of the explored variable as a function of criteria. In summary (for all three Olympiads analyzed, Table 1), the average age of all finalists in men was 24.1 ± 3.6 years, i.e. at the level of the range from 20.5 to 27.6 years (range of MEAN ± SD), while in women it was 23.0 ± 3.7, with a given range of 19.3 to 26.7 years. It was determined that on a general level there is a statistically significant age difference between Olympic male and female swimmers (Wilks' Lambda Value – 0.874, F = 3.704, p = 0.015), and that this difference is responsible for 12.6% of the total variability of the analyzed phenomenon (Eta^2 = 0.126, Observed Power = 0.786).

Table 1. Results of descriptive statistics of the age of top Olympic swimmers in accordance with the explored stratum categories as a function of gender.

	N = M-41; F-40	MEAN	SD	CV (%)	Min	Max	S.E.M (Aps.)	S.E.M (Rel.)
Male	Finalists	24.1	3.6	6.74	17.0	35.0	0.25	0.90
	Medalists	24.1	2.0	8.17	20.3	29.7	0.31	1.04
	No-Medalists	24.0	1.9	7.75	20.4	28.2	0.29	1.03
	Gold	23.6	3.6	15.22	18.0	35.0	0.56	1.60
	Silver	24.3	2. 6	10.54	20.0	31.0	0.40	1.29
	Bronze	24.5	3.8	15.60	17.0	32.0	0.60	1.88
Female	Finalists	23.0	3.7	6.75	15.0	33.0	0.24	0.90
	Medalists	22.7	2.1	9.29	17.7	27.3	0.33	1.21
	No-Medalists	23.1	1.7	7.36	18.6	26.6	0.27	1.02
	Gold	21.7	3.8	17.57	15.0	28.0	0.60	2.14
	Silver	22.6	2.6	11.50	16.0	28.0	0.41	1.46
	Bronze	23.9	3.7	15.28	18.0	33.0	0.58	1.76

Table 2. Results of descriptive statistics of the age of top male Olympic swimmers in relation to disciplines and techniques defined according to the defined stratum categories (Mean ± SD, averaged Min – Max).

Discipline	Finalists	Medalists	No-Medalists	Gold	Silver	Bronze
50 Free	27.0±0.8 (26.3-27.8)	27.9±2.8 (24.7-29.7)	26.4±2.1 (24.2-28.2)	27.0±7.2 (21.0-35.0)	28.3±2.5 (26.0-31.0)	28.3±3.5 (25.0-32.0)
100 Free	22.5±1.0 (21.4-23.4)	24.0±0.9 (23.0-24.7)	21.5±1.2 (20.4-22.8)	22.0±3.6 (18.0-25.0)	24.0±3.6 (21.0-28.0)	26.0±4.4 (21.0-29.0)
200 Free	22.5±1.2 (21.5-23.8)	22.9±2.3 (20.7-25.3)	22.3±1.3 (20.8-23.2)	22.0±2.6 (20.0-25.0)	23.3±1.2 (22.0-24.0)	23.3±3.5 (20.0-27.0)
400 Free	23.2±0.3 (22.9-23.3)	22.5±0.7 (22.0-23.3)	23.5±0.3 (23.2-23.8)	19.7±0.6 (19.0-20.0)	24.3±2.1 (22.0-26.0)	23.7±3.8 (21.0-28.0)
800 Free	24.0±1.6 (22.8-25.1)	23.9±1.2 (23.0-24.7)	24.1±1.8 (22.8-25.4)	22.0±0.2 (22.0-22.4)	26.0±1.4 (25.0-27.0)	23.5±2.1 (22.0-25.0)
1500 Free	23.3±1.1 (22.5-24.5)	23.5±0.4 (23.0-23.7)	23.2±1.6 (21.8-25.0)	21.3±1.2 (20.0-22.0)	24.3±1.2 (23.0-25.0)	24.7±3.1 (22.0-28.0)
100 Back	24.5±0.9 (24.0-25.6)	24.4±0.5 (24.0-25.0)	24.5±1.1 (23.8-25.8)	24.3±3.1 (21.0-27.0)	22.7±2.9 (21.0-26.0)	26.3±4.5 (22.0-31.0)
200 Back	23.1±2.1 (21.9-25.5)	23.4±1.9 (21.3-25.0)	22.9±2.6 (20.6-25.8)	23.0±2.0 (21.0-25.0)	23.7±2.1 (22.0-26.0)	23.7±3.5 (20.0-27.0)
100 Breast	25.4±0.4 (25.1-25.8)	25.5±1.1 (24.7-26.7)	25.6±0.5 (25.2-26.2)	24.3±2.5 (22.0-27.0)	26.7±1.2 (26.0-28.0)	25.3±4.2 (22.0-30.0)
200 Breast	24.4±1.7 (22.6-26.0)	23.1±2.2 (21.0-25.3)	25.1±1.4 (23.6-26.4)	22.0±1.0 (21.0-23.0)	24.0±1.7 (23.0-26.0)	23.3±4.5 (19.0-28.0)
100 Fly	23.5±1.8 (21.5-25.0)	24.2±1.9 (22.0-25.3)	23.1±1.8 (21.2-24.8)	24.3±3.1 (21.0-27.0)	21.7±2.1 (20.0-24.0)	26.7±5.9 (20.0-31.0)
200 Fly	23.9±0.5 (23.4-24.3)	23.1±2.5 (20.3-25.0)	24.3±0.9 (23.4-25.2)	24.0±6.1 (20.0-31.0)	22.7±3.8 (20.0-27.0)	22.7±4.6 (20.0-28.0)
200 Mix	26.0±0.7 (25.1-26.5)	25.9±0.9 (25.0-26.7)	26.0±1.6 (24.2-27.0)	28.3±2.3 (27.0-31.0)	24.3±2.5 (22.0-27.0)	25.0±2.6 (22.0-27.0)
400 Mix	23.3±1.1 (22.4-24.5)	23.3±1.4 (22.0-24.7)	23.3±1.0 (22.6-24.4)	25.3±2.9 (22.0-27.0)	24.7±2.3 (22.0-26.0)	20.0±2.6 (17.0-22.0)

Table 2 shows the basic descriptive data of the explored variable as a function of criteria for male sample. In summary, for all three Olympiads analyzed, the oldest age of all finalists in men was at 50 free (27.0 ± 0.8 years), then it was at 200 Mix and 100 Breast (26.0 ± 0.7, and 25.4 ± 0.4 years, respectively). In general, the youngest swimmers were finalists in the 100 and 200 free (22.5 ± 1.0, and 22.5 ± 1.2, respectively).

Table 4 shows the results of the basic descriptive statistics of the age of top Olympic swimmers with a confidence interval of the mean value in relation to the qualitative aspect of the distance, i.e. sprinters, middle-distance and long-distance swimmers according to gender. The results of the multivariate tests - MANOVA showed that in the general only the age of the tested swimmers in relation to the qualitative criterion of swimming distance is statistically significantly different between the gender at the level of Wilks' Lambda value = 0.886, F = 3.12, p = 0.000, Partial Eta^2 = 0.114 (11.4%), observed Power = 0.704. In relation to the criterion of distance and the cross influence of Gender x Distance, no statistically significant difference was found (Wilks' Lambda value = 0.877 and 0.948, F = 1.65 and 0.657, p = 0.138 and 0.684, Partial Eta^2 = 0.063 (6.3%) and 0.026 (2.6%), observed Power = 0.616 and 0.255, respectively).

Table 3 shows the basic descriptive data of the explored variable as a function of criteria for female sample. In summary, for all three Olympiads analyzed, the oldest age of all finalists in women was, also, at 50 Free (25.9 ± 1.2 years), then it was at 100 Free and 400 Medley (23.8 ± 2.4, and 23.4 ± 2.6 years, respectively). In general, the youngest female swimmers were finalists in the 400 Free (21.6 ± 1.7).

Table 3. Results of descriptive statistics of the age of top female Olympic swimmers in relation to disciplines and techniques defined according to the defined stratum categories (Mean ± SD, averaged Min – Max).

Female	**Finalist**	**Medalis**	**No-Medalist**	**Gold**	**Silver**	**Bronze**
50 Free	25.9±1.2 (24.5-26.8)	26.1±1.6 (24.3-27.3)	25.7±1.0 (24.6-26.4)	23.3±3.2 (21.0-27.0)	24.7±4.2 (20.0-28.0)	30.3±3.1 (27.0-33.0)
100 Free	23.8±2.4 (22.4-26.6)	22.8±3.6 (19.7-26.7)	24.5±2.0 (22.6-26.6)	21.3±5.5 (16.0-27.0)	23.3±3.1 (20.0-26.0)	23.7±5.0 (19.0-29.0)
200 free	22.9±0.9 (22.0-23.8)	21.9±0.5 (21.3-22.3)	23.4±1.5 (21.8-24.8)	20.7±1.5 (19.0-22.0)	23.0±1.0 (22.0-24.0)	22.0±1.0 (21.0-23.0)
400 Free	21.6±1.7 (19.6-22.6)	21.9±0.5 (21.3-22.3)	21.5±2.5 (18.6-23.0)	20.7±1.5 (19.0-22.0)	24.0±2.0 (22.0-26.0)	21.0±2.0 (19.0-23.0)
800 Free	22.3±1.1 (21.4-23.4)	21.7±1.7 (19.7-22.7)	22.6±1.3 (21.4-24.0)	19.3±4.5 (15.0-24.0)	22.7±2.9 (21.0-26.0)	23.0±0.0 (23.0-23.0)
1500 Free	22.8±2.6 (19.0-27.0)	24.0±3.0 (21.0-27.0)	22.0±2.2 (10.0-25.0)	24.0	21.0	27.0
100 Back	21.9±1.0 (21.0-22.9)	21.5±0.4 (21.3-22.0)	22.1±1.6 (20.8-23.8)	21.3±5.1 (17.0-27.0)	21.3±3.2 (19.0-25.0)	22.0±4.4 (19.0-27.0)
200 Back	22.3±1.3 (21.4-23.8)	23.0±3.1 (19.3-25.0)	21.9±1.5 (20.2-23.0)	20.0±3.0 (17.0-23.0)	24.3±2.5 (22.0-27.0)	24.3±5.0 (19.0-29.0)
100 Breast	22.6±0.9 (21.6-23.3)	21.6±1.2 (20.3-22.7)	23.2±0.7 (22.4-23.6)	17.0±2.0 (15.0-19.0)	24.3±0.6 (24.0-25.0)	23.3±2.1 (21.0-25.0)
200 Breast	23.3±0.4 (23.0-23.8)	24.0±1.7 (22.0-25.0)	22.9±0.8 (22.0-23.6)	25.7±2.1 (24.0-28.0)	23.0±1.7 (21.0-24.0)	23.3±3.5 (20.0-27.0)
100 Fly	22.6±0.5 (22.1-23.2)	23.4±0.6 (22.7-23.7)	22.1±0.8 (21.2-23.2)	22.7±1.5 (21.0-24.0)	20.7±4.0 (16.0-23.0)	26.7±2.5 (24.0-29.0)
200 Fly	23.0±1.7 (21.5-24.9)	22.7±1.8 (20.7-24.3)	23.3±2.4 (21.8-26.0)	23.0±3.0 (20.0-26.0)	20.3±1.2 (19.0-21.0)	24.7±3.2 (21.0-27.0)
200 Medley	22.9±0.5 (22.6-23.5)	22.0±1.7 (20.3-23.7)	23.5±0.5 (23.0-24.0)	23.0±6.1 (16.0-27.0)	21.7±2.1 (20.0-24.0)	21.3±1.5 (20.0-23.0)
400 Medley	23.4±2.6 (20.5-25.5)	22.4±4.1 (17.7-25.3)	23.9±2.1 (22.2-26.2)	23.0±6.1 (16.0-27.0)	20.7±2.1 (19.0-23.0)	23.7±4.9 (18.0-27.0)

Table 4. Results of the basic descriptive statistics of the age of top Olympic swimmers in relation to sprinters, middle distance and long distance swimmers as a function of gender with established ANOVA differences.

Dependent Variable	Gender	Distance	Age	95% Confidence Interval		ANOVA – Tests of Between-Subjects Effects		
				Lower Bound	Upper Bound	F value; p significance; partial Eta^2		
						Gender	Distance	G x D
Medal winners	Female	Sprint	23.1	22.0	24.1	F = 8.73; p = 0.004; Eta^2 = 10.4%	F = 3.14; p = 0.049; Eta^2 = 7.8%	F = 3.08; p = 0.466; Eta^2 = 2.0%
		Middle	22.6	21.6	23.5			
		Long	22.3	20.8	23.8			
	Male	Sprint	25.2	24.2	26.2			
		Middle	23.5	22.5	24.4			
		Long	23.5	22.1	24.9			
Other finalists	Female	Sprint	23.5	22.6	24.4	F = 3.39; p = 0.070; Eta^2 = 4.3%	F = 0.85; p = 0.431; Eta^2 = 2.2%	F = 1.34; p = 0.664; Eta^2 = 1.1%
		Middle	22.7	21.9	23.6			
		Long	23.1	21.7	24.4			
	Male	Sprint	24.2	23.3	25.2			
		Middle	24.0	23.2	24.9			
		Long	23.5	22.2	24.7			
Finalists	Female	Sprint	23.4	22.5	24.2	F = 7.45; p = 0.008; Eta^2 = 9.0%	F = 2.25; p = 0.113; Eta^2 = 5.6%	F = 0.46; p = 0.833; Eta^2 = 0.5%
		Middle	22.7	21.9	23.4			
		Long	22.8	21.6	24.0			
	Male	Sprint	24.6	23.8	25.4			
		Middle	23.8	23.1	24.6			
		Long	23.5	22.4	24.6			

Figures 1 and 2 show the results of the trend of change in the average age of top Olympic swimmers in relation to the analyzed Olympic Games. Figure 3 shows the results of the overall average age of top Olympic swimmers as a function of swimming strokes for all analyzed Olympic games.

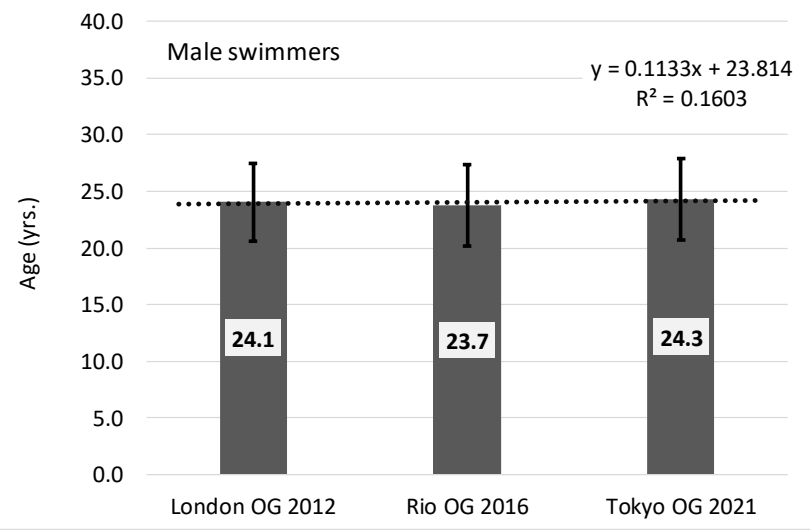

Figure 1. The average age of finalist male swimmers in the last three Olympics with the defined change trend equation.

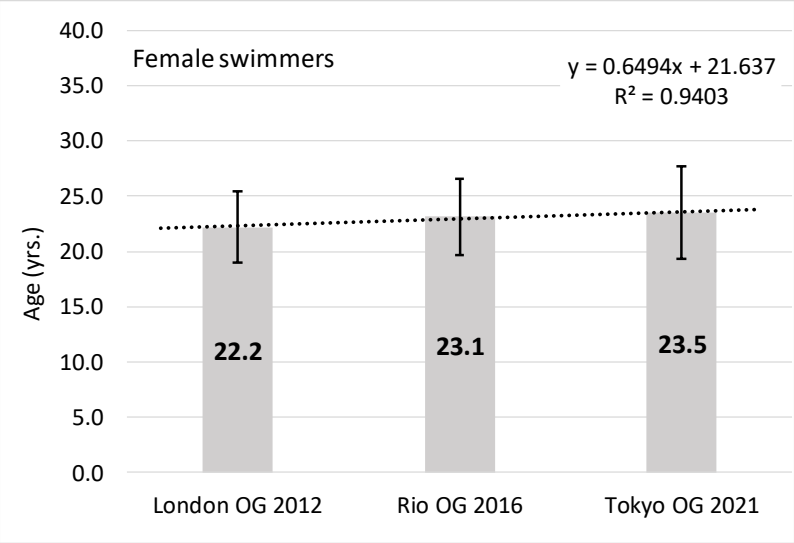

Figure 2. The average age of finalist female swimmers at the last three Olympics with the defined change trend equation.

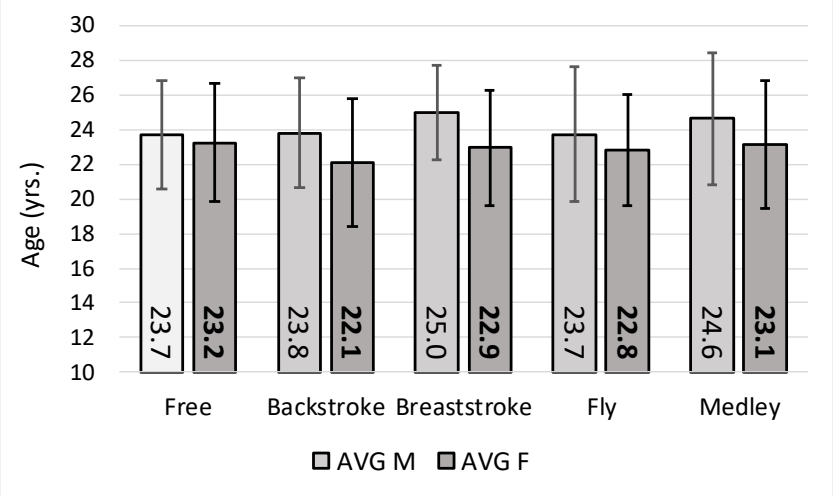

Figure 3. The average age of elite Olympic swimmers according to stoke and gender.

Discussion

Swimming, as one of the oldest sports in human history, is a constant subject of scientific research (Lohn, 2021). One of the most common research phenomena in sports, in a general, and also in swimming as an individual sport, is the age of swimmers at which top results are achieved (Okičić et al., 2007; Đurović et al., 2020; Mallett et al., 2021; Gorzi et al., 2022).

The results showed that the Olympic elite male swimmers, on average, were statistically significantly older than Olympic elite female swimmers (Wilks' Lambda Value – 0.874, F = 3.704, p = 0.015) by 1.1 years, or 4.8% (Table 1). Generally observed (OG 2012, 2016 and 2021) in relation to the of success (medal winners' vs other finalists), the age of between gender - male and female swimmers, is statistically significantly different: medal winners' F = 9.56, p = 0.003 (Eta^2 = 0.108, Observed Power = 0.863), as well as other finalists' F = 5.15, p = 0.026 (Eta^2 = 0.061, Observed Power = 0.611). In other words, the male medal winners are statistically

significantly older than the female medal winners (Males: Medal-winning swimmers – 24.1 ± 2.0 years, i.e. at the level of the range from 22.1 to 26.1 years on average; Females: medalist swimmers - 22.7 ± 2.1 years, i.e. at the level of the range from 20.6 to 24.8 years on average), just as the other male finalists are statistically significantly older than the other female finalists (Males: No-Medalist finalist swimmers - 24.0 ± 1.9 years, i.e. at the level of the range from 22.1 to 25.9 years on average; Females: finalist swimmers - 23.1 ± 1.7 years, i.e. at the level of the range from 21.4 to 24.8 years on average).

A slightly higher influence of the difference between the sexes in medalists compared to No-Medalists (Eta^2 = 10.8 vs 6.1%), may indicate the possible fact of a higher influence of chronological age (chronological maturity) in male competition on winning medals at the Olympic Games, compared to female competition. This possible claim is accompanied by the fact of a quantitatively greater age difference between the medal winners between the sexes (1.4 years, and 5.81%) compared to the mentioned values of the differences between all finalists (1.1 years, i.e. 4.8%).

The results of the differences in relation to the distance (sprinters, 50 and 100m; middle-distance, 200 and 400m; and long-distance, 800, 1500m and 400 mix) showed that a statistically significant difference between the sexes was found in medal winners as a function of swimming distance ($F = 8.73$, $p = 0.004$, $Eta^2 = 10.4\%$), but that difference also exists between distances ($F = 3.14$, $p = 0.049$, $Eta^2 = 7.8\%$, Table 4). In other words, the age of sprinters, middle-distance and long-distance differs between male and female swimmers, and the age of sprinters, middle-distance and long-distance swimmers also differs in general. The results showed that sprinters are statistically significantly older ($p = 0.049$) than middle and long-distance swimmers whose ages do not differ from each other. From a practical point of view, among medal winners, sprinters are on average the oldest individuals in elite Olympic swimming regardless of gender, and this is especially true for the distance of 50m freestyle (male medalists 27.9±2.8, female medalists 26.1±1.6 yrs., Table 2 and 3).

In relation to the overall average age results (Table 1), it can be concluded that the Gold medalists are the youngest of all other strata of elite Olympic swimmers (Males - 23.6±3.6, Females - 21.7±3.8 yrs.). This fact is most likely an indication that training in relation to extremely talented swimmers, regardless of gender, is primarily directed towards achieving the maximum competitive result, i.e. the Olympic gold medal. It is obvious that regardless of the swimmer's chronological age, the training process is directed to the given result potential as a priority goal in working with the mentioned extremely talented swimmers.

In relation to the type of distance, the results showed that, in general, long-distance swimmers are the youngest, followed by middle-distance swimmers and sprinters (Table 4). Considering stoke (Figure 3) among male swimmers, breaststrokers and mix are on average the oldest (25.0 and 24.6 yrs.), while the youngest are free and fly swimmers (23.7 yrs.). Among female swimmers the oldest are free and mix (23.2 and 32.1 yrs.), while the youngest are breaststrokers (22.1 yrs., Figure 3).

By the calculated regression equations, it can be argued at a hypothetical level that the average age of swimmers at the next Olympic Games in Paris in 2024 will be 24.3 years, but that the average age of female swimmers will be 24.2 years (almost equal to male swimmers). Based on these hypothetical assumptions, it is possible that at the Olympic Games in Paris, the age of male and female swimmers will become equal on average for the first time in history, which will certainly be the subject of verification and research in the future as well.

The results of this study agree with the general data on the age of top athletes from various sports and, it can be argued that in relation to the established results (as a researched phenomenon) they are directly related to the biological basis of human morphology, psychology and physiology in relation to the potential to achieve top sports results (Wylleman & Reints, 2010; Allen & Hopkins, 2015; Đurović et al., 2020). Namely, previous systematic public research has shown that there is a significant relationship between the age of peak career performance and the type of physical effort such as explosive power or sprinting disciplines, in relation to

endurance disciplines. In the disciplines dominated by explosive power or sprinting, the peak of results occurred in the range of about 27 years (1-20 sec), while with the increase in the duration of the race, the age decreased to about 20 years (21- 245 s). Also, a small difference in peak age estimates for these types of competitive events was found between men and women (Allen & Hopkins, 2015).

In previous research, it was established that the biological peak of the muscle component in the body is found at the age of about 25 to 35 years, regardless of gender (Dopsaj et al., 2020[a]). In other words, at a given age, human beings have the biggest biological potential for achieving the maximal level of manifestation of strength or power characteristics. Also, it was determined that, in relation to body composition, the result of sprint swimming is associated with 35.1 and 75.1% in male and female swimmers, respectively, with optimal representation of contractile (muscle) tissue (Dopsaj et al., 2020[b]). This means that the result in sprint disciplines for female swimmers depends more on the muscular component in the body compared to male swimmers, which in female swimmers may also represent the basis of the biological potential of the tendency to reach the peak results at an older age than was the case in previous Olympics.

Of course, factors such as experience, motivation, training conditions, control and method of supplementation, recovery methods, quality of supplementary training (dry and gym), social and material status of living conditions have a very significant influence on the duration of the career, i.e. on Age-peak performance relationship (Wylleman & Reints, 2010; Đurović et al., 2020; Dopsaj et al., 2023).

Practical Implications

The results showed that the average age of elite male and female swimmers who were finalists at the last three Olympiads was 24.1 ± 3.6 years, and for women it was 23.0 ± 3.7 years, respectively. The age of elite Olympic male and female swimmers is statistically significantly different. In relation to the qualitative aspect of the characteristics of swimming distances, i.e. sprinters, middle distance and long distance swimmers according to gender, it was found that sprinters are statistically significantly older, regardless of gender, while no difference was found between middle and long distance swimmers. It should be noted that long distance swimmers are generally at youngest age. Among medal winners, sprinters are on average the oldest individuals in elite Olympic swimming regardless of gender, especially at the distance of 50m freestyle (male medalists 27.9±2.8, female medalists 26.1±1.6 yrs.).

Considering stroke, among male swimmers, breaststrokers and mix are on average the oldest one (25.0 and 24.6 yrs.), while the youngest are free and fly swimmers (23.7 yrs.). Among female swimmers the oldest are free and mix (23.2 and 23.1 yrs.), while the youngest are breaststrokers (22.1 yrs.).

The results of regression equations, showed that, at a hypothetical level, the average age of swimmers at the next Olympic Games in Paris in 2024 will be 24.3 years, but that the average age of female swimmers will be 24.2 years (almost equal to male swimmers).

Acknowledgment**:** There is no conflict of interest by authors considering this paper.

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