

Monitoring the formation of swimming skills among men and women in the world Universiade program (at stages I-II from 1959 to 2019)

ALEKSIY GANCHAR¹, IVAN GANCHAR², OLEG CHERNYAVSKIY³, CONSTANTIN CIORBA⁴, SERHII MEDYNSKIY⁵, OLHA PYLYPKO⁶, OLEKSANDR ARKHYPYOV⁷

^{1,2,3}Institute of Naval Forces of the Odessa National University “Odessa Maritime Academy”, Odessa, UKRAINE.

⁴State Pedagogical University „Ion Creanga” from Chisinau, MOLDOVA.

⁵Bogdan Khmelnytsky Melitopol State Pedagogical University, Melitopol, UKRAINE.

⁶Kharkiv State Academy of Physical Culture, Kharkiv, UKRAINE.

⁷National Pedagogical Dragomanov University, Kyiv, UKRAINE.

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Abstract:

Purpose: The International University Sports Federation, which includes swimming in its Summer World University Games, has received the University Games World Championship title since 1959. Swimming has been presented at the 1st Universiade since 1959, to date 30 have been held. The purpose of this study is to determine the indicators of swimming skills among men and women of different ages at 14 World Swimming Universities in Stage I (1959-1991), and among 14 facts Swimming World Universiade in Stage II (1993-2019).

Material: The results of the swimmers-finalists were summarized and analyzed for Stage I among 538 men and 456 women and for Stage II, among 828 men and 816 women. **Results:** The formation dynamics of swimming athletic skills for various marathon distances for different age groups were identify for men and women and the total significant difference in average speed indicators for all distances for men and women were determined. The formation dynamics of physical swimming skills for various marathon distances for different age groups are presented in detail and significant differences in the average swimming speed for all marathon distances are determined. **Conclusions:** The obtained results will make a significant scientific and methodological contribution to the further improvement of physical education and sports in a gender approach in the process of training and improvement evaluation of youth in the physical education and sport. This can motivate the youth to achieve better swimming result at prestigious competitions, which are the summer swimming marathons at all World University Games, Stage I and II. This study presents the details of the past and present state development of trends in athlete skills formation among swimmers of all ages and gender over a long period of time: from birth, development and stabilization of the ability to properly and reliably improve to the level of prestigious competitions.

Key words: swimmers, differences, stroke, indicators, Universiade.

Introduction.

As of today, there are no scientific studies on the formation of swimming skills among men and women for all years in the world Universiade program. Existing scientific articles related to world-class swimming competitions are analyzed the performance of finalist swimming athletes in Olympic games: reaction time, partial time, speed, and final time of freestyle swimmers at the Beijing 2008, London 2012, and Rio 2016 Olympics (Da Silva, 2020); explore levels of swimming skills the strongest teams of swimmers I-XXXIV championships in water sports from 1926 to 2018 (Ganchar, 2021); study the correctness of formation of motor swimming skills in men and women at the world water sports championships I-II stages 1973-2019 (2Ganchar, 2021). Large number of articles related to study correlation between individual elements of swimming technique and results of athletes: observed high correlations between the different indicators of WANt and swimming speed or swimming achievements, and others have observed a lower or no significant correlations (Kachaunov, 2020); using different types of resistance (parachute, elastic bands or a bowl) with maximal effort in short distance swimming where force and speed of swimming can be set individually for each swimmer (Ravé 2018); special exercise in the training process will improve the performance of swimmers, what will result in improved times and decreasing number of kicks in the 50-meter test using flutter kicking (Mandzák 2020); using special sprint training program with isokinetic conditions swimming have increasing the force of strokes. Greater stroke force is a potentially more efficient propulsion and consequently results in better swimming performance (Odráška, 2020); selection of exercises to improve the movements of the legs and body in butterfly, methodology of training athletes in training backstroke. Positive transfer of the basic physical qualities and basic

skills to special swimming readiness contributes to the effective formation of the structure of swimming techniques (Ivanenko, 2020).

Furthermore, there are lot of studies that determine teaching methods and characterize various approaches in educational technologies of study in sphere of sports and physical culture: education training such as mentoring programs interventions (e.g., setting Pre-service Teachers' to learn as a community of learners) that seek to apply social learning theory in practice and course units that promote experiences with the Student-Centred Models SCM curriculum in the role of learners (i.e., learning how to do) are key strategies for facilitating Pre-service Teachers' professional development (Valério, 2021); applied comparative analysis for study components and curriculum content the phenomena of relative similarity of content components of the USA physical education field academic plans (Medynskyi S, 2014). According to the literature and field experience, swimming is one of the most popular mass sporting events among students. Therefore, the International University Sports Federation (-FISU), almost always includes swimming in its program of the Summer World University Games, which has obtained the title of World Championship of University Games since 1959. Swimming has been presented at the 1st Universiade since 1959, to date, 30 events have already occurred (Ganchar, 2013, 2014). The program has significantly expanded from 15-16 swimming strokes in 1959-1965 to 22 types of programs in 1967, 1977, 26 in 1979, 29 in 1981-1983, 30 in - 1985, 32 – in 1987-1991, 34 in - 1993-1999, 40 in 2001-2009, and 42-43 in 2011-2019 (<http://www.fisu.net>, <https://www.swimrankings.net>, Ganchar, 2015, 2017, 2019). This allows many students to participate in many swimming starts at the World University Games that are held under the FISU. Of note, however, in 1975 and 1989 the World University Games were implemented with a short program (athletics – in 1975 at VIII; athletics, basketball, fencing, and rowing in 1989 at XV); thus swimming was not conducted in addition to other sports (Firsov 1976, Hannula 2001, Platonov 2004, Schubert 1990, Schramm, 1987). Of note, students can participate in these prestigious competitions up to 28 years of age during the period of professional training at higher education institutions. The aim of this study is to determine the level and degree of physical swimming skills in swimmer-winners by monitoring the final swim competition results at all University Games from 1959 to 2019. The advanced tasks of the study are: a) to determine the main differences and similarities in the achievements dynamics in swimmer-medalists in the practice of youth participation at the start of the World University Games during 1959--2019; b) to introduce the most significant results of the study into the practice of assessing the swimming skills state in different age groups. Based on the solution of the proposed tasks, we selected an appropriate object to study, i.e., to monitor the results of training indicators and improving physical skills in swimming among young people at prestigious competitions in the past and present stages of their periodic implementation. The subject of this study is similarity and difference peculiarities, which are determined by observing the level of swimming athlete skills in swimmer-winners of all ages and gender at University Games from 1959 to 2019.

Methods of research

Theoretical analysis of the literature concerning the problem (rarely investigated); documentary materials generalization (official protocols analysis of all conducted University Games in Stages 1-2 from 1959 to 1991 and from 1993 to 2019, which are located on websites (<http://www.fisu.net> and <http://www.swimrankings.net>); monitoring the ascertaining and comparative experiment (it was used to obtain data that allowed to determine and compare generalized averages in achievements of both men and women swimmers in all distances of sports and swimming marathon in the competition program), mathematical statistics (its use became necessary and unconditional to determine the average in the swimmers achievements at different distances and to determine their ability to demonstrate reliability at the significance level, above – $p \geq 0,05$). Results. When considering the results at the final starts of the I-XVI World University Games from 1959 to 1991, the average speed of medal swimmers at different distances was determined. These indicators reflect the achievement state of physical swimming skills among the participants of the final swim, representing the physical abilities of both men and women to pass certain distances in different ways, taking into account their age and gender (Table 1).

Table 1. Average differences in the results of swimming skill formation among runner-ups at final swim competitions for different strokes at the World University Games 1959-1991

| Results of swimmers | | | Distance, strokes | Age of swimmers | | |
|---------------------|-----------|-------------|-----------------------|-----------------|-------|--------------|
| Men=538 | Women=456 | differences | | men | women | ± difference |
| 23,11 | 26,20 | 3,09 | 50 m, freestyle | 22 | 20 | +2 |
| 53,24 | 1.01,14 | 7,90 | 100 m, freestyle | 22 | 21 | +1 |
| 1.51,92 | 2.03,45 | 11,53 | 200 m, freestyle | 21 | 20 | +1 |
| 4.11,00 | 4.42,52 | 31,52 | 400 m, freestyle | 21 | 19 | +2 |
| 17.30,67 | 8.49,17 | 1,51-1,42 | 1500/800 m, freestyle | 21 | 19 | +2 |
| 59,59 | 1.01,69 | 2,10 | 100 m, backstroke | 21 | 20 | +1 |
| 2.08,75 | 2.12,27 | 3,52 | 200 m, backstroke | 21 | 21 | 0 |
| 1.05,64 | 1.14,58 | 8,94 | 100 m, breaststroke | 21 | 20 | +1 |
| 2.27,87 | 2.46,47 | 18,60 | 200 m, breaststroke | 21 | 21 | 0 |
| 56,01 | 1.06,96 | 10,95 | 100 m, butterfly | 21 | 20 | +1 |

| | | | | | | |
|--|---------|---------|--------------------|----|----|----|
| 2.07,53 | 2.15,03 | 7,50 | 200 m, butterfly | 22 | 20 | +2 |
| 2.05,26 | 2.23,91 | 18,65 | 200 m, medley | 21 | 20 | +1 |
| 4.21,07 | 4.55,86 | 34,79 | 400 m, medley | 20 | 20 | 0 |
| 3.33,97 | 4.13,02 | 39,05 | 4×100 m, freestyle | 22 | 20 | +2 |
| 7.06,12 | 8.20,14 | 1.14,12 | 4×200 m freestyle | 20 | 20 | 0 |
| 3.59,36 | 4.39,74 | 40,38 | 4×100 m, medley | 21 | 20 | +1 |
| Difference of age of swimmers-winners: men, $x \pm m = 23,67 \pm 0,84$; women, $x \pm m = 23,35 \pm 1,24$; $t = 0,29$, $p > 0,05$ | | | | | | |

Reviewing the final starts allows us to objectively study the state of development of swimming physical skills in the strongest swimmer-winners at different distances and to determine the peculiarities of trends in the results dynamics between men and women in different age groups. The largest age difference of participants was found in men compared to women in 12 cases ranging from 1 to 2 years. No difference in age of men from women was observed in 4 cases: 200 m on the back, 200 m breaststroke, 400 m complex swimming, and 4×200 m freestyle relay. Meanwhile, there was no predominance of women over men at all swimming distances (men, $x \pm m = 23.67 \pm 0.84$; women, $x \pm m = 23.35 \pm 1.24$; $t = 0.29$, $p > 0.05$). The absolute values of the average swimming speed showed the long-term trends in the difference between the results of men and women and presented themselves in accordance with an increase in the passing distance. Therefore, the results of the swimmer-medalists should be considered in terms of the ratio of the average swimming speed at competitive distances for any stroke, according to the events program that occurred over a long period of time.

Table 2 shows the general results of differences in the average speed of overcoming distance by different ways of swimming among men and women swimmer-medalists among the final swim participants in different ways of swimming in 14 cases of World University Games 1959-1991, at the first stage of their periodic implementation. Table 2 shows the overall results of differences in the average speed of passing distance by different strokes among men and women; men differ by a higher level of results than women, first, at swimming relay distances: 4×100 m, 4×200 m, 4×100 medley – 0.27 m/s, then at freestyle swimming distances: 50-100-200 m – 0.22 m/s, then at medley swimming distances: 200-400 m – 0.20 m/s.

Table 2. Average indicators of results difference in the swimming skill formation among swimmer-medalists during the finals for different strokes at the World University Games 1959-1991

| Distance, strokes | Average swimming speed: distance, time men/women | Difference in average swimming speed, men/women, m/s | Difference of swimming distance men /women, m/s | Difference swimmers men/women m/s |
|--|--|--|---|-----------------------------------|
| 50 m, freestyle | 50:23,11-50:26,20 | 2,16-1,90=0,26 | 0,22 | 0,17±0,14 t= 2,81, p<0,05 |
| 100 m, freestyle | 100:53,24-100:1.01,04 | 1,88-1,63=0,25 | | |
| 200 m, freestyle | 200:1.51,92-200:2.03,45 | 1,78-1,62=0,16 | | |
| 400 m, freestyle | 400:4.11,00-400:4.42,52 | 1,59-1,42=0,17 | | |
| 1500-800 m, freestyle | 1500:17.30,67-800:8.49,17 | 1,51-1,42=0,09 | 0,13 | |
| 100 m, backstroke | 100:59,59-100:1.01,69 | 1,68-1,62=0,06 | 0,05 | |
| 200 m, backstroke | 200:2.08,75-200:2.12,27 | 1,55-1,51=0,04 | | |
| 100 m, breaststroke | 100:1.05,64-100:1.14,58 | 1,52-1,34=0,18 | 0,17 | |
| 200 m, breaststroke | 200:2.27,87-200:2.46,47 | 1,35-1,20=0,15 | | |
| 100 m, butterfly | 100:56,01-100:1.06,96 | 1,78-1,49=0,29 | 0,19 | |
| 200 m, butterfly | 200:2.07,53-200:2.15,03 | 1,57-1,48=0,09 | | |
| 200 m, medley | 200:2.05,26-200:2.23,91 | 1,60-1,39=0,21 | 0,20 | |
| 400 m, medley | 400:4.21,07-400:4.55,86 | 1,53-1,35=0,18 | | |
| 4×100 m, freestyle | 400:3.33,97-400:4.13,02 | 1,87-1,58=0,29 | 0,27 | |
| 4×200 m, freestyle | 800:7.06,12-800:8.20,14 | 1,88-1,60=0,28 | | |
| 4×100 m, medley | 400:3.59,36-400:4.39,74 | 1,67-1,42=0,25 | | |
| Difference in average swimming speed, m/s: men, $x \pm m = 1,81 \pm 0,16$; women, $x \pm m = 1,64 \pm 0,13$; $t = 2,81$, $p < 0,05$ | | | | |

In the further review (Table 3), there is a gradual decrease in indicators in overcoming distances for 100-200 m butterfly stroke – 0.19 m/s, then at distances of 100-200 m breaststroke – 0.17 m/s, and at distances of floating 400-800-1500 m freestyle – 0.13 m/s. Thus, the smallest difference between the average swimming speeds was typically represented by only 100-200 m with a backstroke – 0.05 m/s. Therefore, the overall average swimming speed at these prestigious competitions is over – 0.17 m/s (men, $x \pm m = 1.81 \pm 0.16$; women, $x \pm m = 1.64 \pm 0.13$; $t = 2.81$, $p < 0.05$).

Table 3. Average indicators of differences in the results of swimming skill formation among swimmers-medalists in the finals for different swimming distances at the World University Games from 1959 to 1991

| Distance, strokes | Average swimming speed (distance: time) men-women | Difference in average speed, men/women, m/s | Difference of swimming distance men /women, m/s | Difference Swimmers men/women, m/s |
|---------------------|---|---|---|------------------------------------|
| 50 m, freestyle | 50:23,11-50:26,20 | 2,16-1,90=0,26 | 0,26 | 0,17±0,14 t= 2,81, p<0,05 |
| 100 m, freestyle | 100:53,24-100:1.01,04 | 1,88-1,63=0,25 | 0,20 | |
| 100 m, backstroke | 100:59,59-100:1.01,69 | 1,68-1,62=0,06 | | |
| 100 m, breaststroke | 100:1.05,64-100:1.14,58 | 1,52-1,34=0,18 | | |
| 100 m, breaststroke | 100:56,01-100:1.06,96 | 1,78-1,49=0,29 | | |

| | | | |
|--|---------------------------|----------------|------|
| 200 m, freestyle | 200:1.51,92-200:2.03,45 | 1,78-1,62=0,16 | 0,13 |
| 200 m, backstroke | 200:2.08,75-200:2.12,27 | 1,55-1,51=0,04 | |
| 200 m, breaststroke | 200:2.27,87-200:2.46,47 | 1,35-1,20=0,15 | |
| 200 m, butterfly | 200:2.07,53-200:2.15,03 | 1,57-1,48=0,09 | |
| 200 m, medley | 200:2.05,26-200:2.23,91 | 1,60-1,39=0,21 | 0,22 |
| 400 m, freestyle | 400:4.11,00-400:4.42,52 | 1,59-1,42=0,17 | |
| 400 m, medley | 400:4.21,07-400:4.55,86 | 1,53-1,35=0,18 | |
| 4×100 m, freestyle | 400:3.33,97-400:4.13,02 | 1,87-1,58=0,29 | |
| 4×100 m, mixed | 400:3.59,36-400:4.39,74 | 1,67-1,42=0,25 | 0,18 |
| 1500-800 m, freestyle | 1500:17.30,67-800:8.49,17 | 1,51-1,42=0,09 | |
| 4×200 m, freestyle | 800:7.06,12-800:8.20,14 | 1,88-1,60=0,28 | |
| Difference in average swimming speed, m/s: men, $x \pm m = 1,81 \pm 0,16$; women, $x \pm m = 1,64 \pm 0,13$; $t = 2,81$, $p < 0,05$ | | | |

Meanwhile, the difference between the results of the parameters of the average speed among men and women at different distances is to some extent characterized by the degree of athlete swimming skill formation (Table 3). The smallest difference is typical for them at 200 m – 0.13 m/s, in the middle and long distance of freestyle swimming at 800-1500 m – 0.18 m/s, then at swimming distances of 100 m – 0.20 m/s, in swimming 400 m using different ways of swimming – 0.22 m/s, and the biggest difference is in swimming 50 m – 0.26 m/s. The difference between the maximum and minimum – 0.27-0.13 m/s > 0.14 m/s. The overall difference in the average speed of swimming according to the physical swimming skills state of these prestigious competitions from 1959 to 1991 is over – 0.17 m/s (men, $x \pm m = 1.81 \pm 0.16$; women, $x \pm m = 1.64 \pm 0.13$; $t = 2.81$, $p < 0.05$). In a detailed examination of the results at the final starts of the 14 World University Games from 1993 to 2019 medal-swimmers at different distances obtained average results that are characterized for the most participants of these world prestigious competitions among men and women, taking into account their age. A detailed examination of the final starts allows us to study the state of swimming physical skill formation in the strongest swimmer-winners at different distances, and to determine the differences in the results dynamics among men and women in different age groups (Table 4). The largest age difference of participants was found in men compared to women in 7 cases in the range from 1 to 2 years (men, $x \pm m = 22.05 \pm 0.52$; women, $x \pm m = 21.71 \pm 0.47$; $t = 0.02$, $p > 0.05$). A decrease in the age difference between men and women was observed in 2 cases at 400 m freestyle and 400 m integrated swimming. Meanwhile, the characteristic lack of any preference for women over men and vice versa for men over women is distinctively observed in 12 cases at these world prestigious competitions.

Table 4. Summary the average results of swimmer-medalists in the finals and the participants' ages at the World Swimming University Games at the II stage from 1993 to 2019

| Results of swimmers | | | Distance, strokes | Age of swimmers | | |
|---|-----------|-------------|---------------------|-----------------|-------|--------------|
| Men=828 | Women=816 | differences | | men | women | ± difference |
| 22,36 | 25,43 | 3,07 | 50 m, freestyle | 23 | 22 | +1- |
| 49,50 | 55,55 | 6,05 | 100 m, freestyle | 22 | 22 | 0 |
| 1.49,11 | 2.00,02 | 10,91 | 200 m, freestyle | 22 | 22 | 0 |
| 3.51,47 | 4.18,59 | 27,12 | 400 m, freestyle | 21 | 22 | -1+ |
| 7.57,56 | 8.35,95 | 38,39 | 800 m, freestyle | 21 | 21 | 0 |
| 15.13,17 | 16.27,73 | 1.14,56 | 1500 m, freestyle | 22 | 22 | 0 |
| 25,27 | 28,61 | 3,34 | 50 m, backstroke | 22 | 22 | 0 |
| 55,95 | 1.01,55 | 5,60 | 100 m, backstroke | 22 | 21 | +1- |
| 1.59,01 | 2.12,01 | 13,00 | 200 m, backstroke | 21 | 21 | 0 |
| 27,66 | 31,42 | 3,76 | 50 m, breaststroke | 23 | 22 | +1- |
| 1.01,38 | 1.08,69 | 7,31 | 100 m, breaststroke | 23 | 21 | +2- |
| 2.12,89 | 2.27,77 | 14,88 | 200 m, breaststroke | 22 | 21 | +1- |
| 23,67 | 26,63 | 2,96 | 50 m, butterfly | 23 | 23 | 0 |
| 52,90 | 59,67 | 6,77 | 100 m, butterfly | 22 | 22 | 0 |
| 1.57,83 | 2.10,83 | 13,00 | 200 m, butterfly | 21 | 21 | 0 |
| 2.01,25 | 2.14,63 | 13,38 | 200 m, medley | 22 | 21 | +1- |
| 4.18,60 | 4.44,59 | 25,99 | 400 m, medley | 21 | 22 | -1+ |
| 3.19,03 | 3.44,56 | 25,53 | 4×100 m, freestyle | 22 | 22 | 0 |
| 7.19,31 | 8.07,76 | 48,45 | 4×200 m, freestyle | 22 | 22 | 0 |
| 3.38,69 | 4.06,41 | 27,72 | 4×100 m, medley | 22 | 22 | 0 |
| 1.56,38 | 2.10,72 | 14,34 | 10000 m, marathon | 24 | 22 | +2- |
| Age difference: men, $x \pm m = 22,05 \pm 0,52$; women, $x \pm m = 21,71 \pm 0,47$; $t = 0,02$, $p > 0,05$ | | | | | | |

Table 5 shows the results of significant differences in the indicators of the average speed of distances for different strokes among men and women. Table 5 shows the overall results of reliable difference in data at the level of 0.18 m/s, obtained at Stage II during the investigation from 1993 to 2019 (men, $x \pm m = 1.78 \pm 0.15$; women, $x \pm m = 1.60 \pm 0.13$; $t = 3.41$, $p < 0.05$). Thus, men have a higher level of results than women: at 50-100-200 m freestyle – 0.22 m/s, then at 50-100-200 m butterfly stroke – 0.21 m/s, as well as in relay swimming – 0.20 m/s, then at 50-100-200 m with the backstroke – 0.19 m/s, as well as at distances of 50-100-200 m breaststroke – 0.18 m/s. Lower differences in the average speed of swimming became a characteristic feature of stroke at complex swimming 200-400 m – 0.16 m/s and the marathon – 0.16 m/s. Although the smallest

difference indicator in the parameters of the swimming average speed was characteristically presented only at steer swimming 400-800-1500 m freestyle – 0.14 m/s (Table 5).

Table 5. Summary of the average results of swimmer-medalists in the finals for different ways of swimming at the World University Games at Stage II from 1993 to 2019

| Distance, strokes | Average swimming speed, distance: time, men/women | Difference in average swimming speed, m/s, men/women | Average difference in swimming speed, m/s | Difference swimmers, men/women, m/s |
|---|---|--|---|-------------------------------------|
| 50 m, freestyle | 50:22,36-50:25,43 | 2,23-1,96=0,27 | 0,22 | 0,18±0,14 t=3,41, p<0,05 |
| 100 m, freestyle | 100:49,50-100:55,55 | 2,02-1,80=0,22 | | |
| 200 m, freestyle | 200:1.49,11-200:2.00,02 | 1,83-1,66=0,17 | | |
| 400 m, freestyle | 400:3.51,47-400:4.18,59 | 1,73-1,55=0,18 | 0,14 | |
| 800 m, freestyle | 800:7.57,56-800:8.35,95 | 1,67-1,55=0,12 | | |
| 1500 m, freestyle | 1500:15.13,17-1500:16.27,73 | 1,64-1,52=0,12 | | |
| 50 m, backstroke | 50:25.27-50:28.61 | 1,98-1,74=0,24 | 0,19 | |
| 100 m, backstroke | 100:55,95-100:1.01,55 | 1,78-1,62=0,16 | | |
| 200 m, backstroke | 200:1.59,01-200:2.12,01 | 1,68-1,51=0,17 | | |
| 50 m, breaststroke | 50:27.66-50:31.42 | 1,80-1,59=0,21 | 0,18 | |
| 100 m, breaststroke | 100:1.01,38-100:1.08,69 | 1,63-1,45=0,18 | | |
| 200 m, breaststroke | 200:2.12,89-200:2.27,77 | 1,50-1,35=0,15 | | |
| 50 m, butterfly | 50:23.67-50:26.63 | 2,11-1,87=0,24 | 0,21 | |
| 100 m, butterfly | 100:52,90-100:59,67 | 1,89-1,67=0,22 | | |
| 200 m, butterfly | 200:1.57,83-200:2.10,83 | 1,70-1,53=0,17 | | |
| 200 m, medley | 200:2.01,25-200:2.14,63 | 1,65-1,48=0,17 | 0,16 | |
| 400 m, medley | 400:4.18,60-400:4.44,59 | 1,54-1,40=0,14 | | |
| 4×100 m, freestyle | 400:3.19,03-400:3.44,56 | 2,00-1,78=0,22 | | |
| 4×200 m, freestyle | 800:7.19,31-800:8.07,76 | 1,82-1,64=0,18 | 0,20 | |
| 4×100 m, medley | 400:3.38,69-400:4.06,41 | 1,83-1,62=0,21 | | |
| 10000 m, marathon | 10km:1.56,38-10km:2.10,72 | 1,44-1,28=0,16 | 0,16 | |
| Difference in average swimming speed, m/s: men $x\pm m=1,78\pm 0,15$; women, $x\pm m=1,60\pm 0,13$; $t=3,41$, $p<0,05$ | | | | |

Meanwhile, the difference between the average speed parameters among men and women at different distances is to some extent characterized by the degree of swimming physical skills at different distances, which was obtained for all World University Games at Stage II during 1993-2019. Therefore, the overall average swimming speed of these competitions is > 0.18 m/s. Meanwhile, the difference between the results of the average speed parameters for men and women at different distances characterizes and reflects to a certain extent the degree of their swimming physical skill formation (Table 6).

Table 6. Summary of the average results of swimmer-medalists in the finals at different swimming distances at the World University Games at Stage II from 1993 to 2019

| Distance, strokes | Average swimming speed, distance: time, men/women | Difference of average speed of swimming speed m/s, men/women | Average difference of speed of swimming, m/s | Difference Swimmers men/women, m/s |
|---|---|--|--|------------------------------------|
| 50 m, freestyle | 50:22,36-50:25,43 | 2,23-1,96=0,27 | 0,24 | 0,18±0,15 t=3,41, p<0,05 |
| 50 m, backstroke | 50:25,27-50:28,61 | 1,98-1,74=0,24 | | |
| 50 m, breaststroke | 50:27,66-50:31,42 | 1,80-1,59=0,21 | | |
| 50 m, butterfly | 50:23,67-50:26,63 | 2,11-1,87=0,24 | 0,20 | |
| 100 m, freestyle | 100:49,50-100:55,55 | 2,02-1,80=0,22 | | |
| 100 m, backstroke | 100:55,95-100:1.01,55 | 1,78-1,62=0,16 | | |
| 100 m, breaststroke | 100:1.01,38-100:1.08,69 | 1,63-1,45=0,18 | 0,17 | |
| 100 m, butterfly | 100:52,90-100:59,67 | 1,89-1,67=0,22 | | |
| 200 m, freestyle | 200:1.49,11-200:2.00,02 | 1,83-1,66=0,17 | | |
| 200 m, backstroke | 200:1.59,01-200:2.12,01 | 1,68-1,51=0,17 | 0,19 | |
| 200 m, breaststroke | 200:2.12,89-200:2.27,77 | 1,50-1,35=0,15 | | |
| 200 m, butterfly | 200:1.57,83-200:2.10,83 | 1,70-1,53=0,17 | | |
| 200 m, medley | 200:2.01,25-200:2.14,63 | 1,65-1,48=0,17 | 0,14 | |
| 400 m, freestyle | 400:3.51,47-400:4.18,59 | 1,73-1,55=0,18 | | |
| 400 m, medley | 400:4.18,60-400:4.44,59 | 1,54-1,40=0,14 | | |
| 4×100 m, freestyle | 400:3.19,03-400:3.44,56 | 2,00-1,78=0,22 | 0,19 | |
| 4×100 m, medley | 400:3.38,69-400:4.06,41 | 1,83-1,62=0,21 | | |
| 800 m, freestyle | 800:7.57,56-800:8.35,95 | 1,67-1,55=0,12 | 0,14 | |
| 1500 m, freestyle | 1500:15.13,17-1500:16.27,73 | 1,64-1,52=0,12 | | |
| 4×200 m, freestyle | 800:7.19,31-800:8.07,76 | 1,82-1,64=0,18 | | |
| 10000 m, marathon | 10km:1.56,38-10km:2.10,72 | 1,44-1,28=0,16 | 0,16 | |
| Difference in average swimming speed, m/s: men $x\pm m=1,78\pm 0,15$; women, $x\pm m=1,60\pm 0,13$; $t=3,41$, $p<0,05$ | | | | |

According to the results of the pedagogical study among competitive swimmers, the smallest difference is typical in medium and steer distances of freestyle swimming at 800-1500 m – 0.14 m/s, in marathon

swimming – 0.16 m/s, in 200 m using different ways – 0.17 m/s, in swimming 400 m in different ways of swimming – 0.19 m/s and at 100 m swimming distance – 0.20 m/s. Meanwhile, the biggest difference is recorded in swimming 50 m – 0.24 m/s, where the values of the difference of the maximum and minimum are: 0.24 m/s-0.14 m/s = 0.10 m/s. Therefore, the overall significant difference between the average swimming speeds is >0.18 m/s (men, $x \pm m = 1.78 \pm 0.15$; women, $x \pm m = 1.60 \pm 0.13$; $t = 3.41$, $p < 0.05$).

Discussion.

First, of note, any information related to the study of the results of the World University Games for a long time of their application from 1959 to 2019 among students of different gender is occasionally encountered in theory and in practice, which makes these types of studies significant and relevant. During Stage I of the World University Games during 1959-1991, the greatest age difference between swimmer-medalist was identified in men compared to women in 12 cases at the level of 1- 2 years. Meanwhile, the absence of difference in the age of men from women was observed in 4 cases, in particular at distances of 200 m on the back, 200 m breaststroke, 400 m integrated swimming and 4×200 m freestyle relay. However, no predominance in the age of women compared to that of men occurred at all swimming distances implemented at these prestigious competitions (men, $x \pm m = 23.67 \pm 0.84$; women, $x \pm m = 23.35 \pm 1.24$; $t = 0.29$, $p > 0.05$).

According to the achievements, the results of swimmer-medalists should be considered in relation to the average speed of swimming at different distances for any stroke, which can indicate a certain level of reliable formation of physical swimming skills among young people of different gender. This is especially important and relevant for young swimmers for certain differences, based on the results of physical swimming skill formation among the prize-winners of the finals at different distances, which were characteristically presented at 14 World University Games, starting from 1959 to 1991 of these prestigious world student competitions (men, $x \pm m = 1.81 \pm 0.16$; women, $x \pm m = 1.64 \pm 0.13$; $t = 2.81$, $p < 0.05$).

At the same time, at the finals of the World University Games, which took place from 1993 to 2019, swimmer-medalists at various distances showed average results, which are typical for the majority of participants of these world prestigious competitions among men and women, taking into account their age. A detailed examination of the final starts allows to study the state of physical swimming skill development in the strongest swimmer-medalists at different distances and to determine the differences in the dynamics of results among men and women in different age groups.

It was also stated for the first time that the greatest age difference of participants was found in men compared to women in 7 cases at the level of more than 1- 2 years among swimmer-medalists (men, $x \pm m = 22.05 \pm 0.52$; women, $x \pm m = 21.71 \pm 0.47$; $t = 0.02$, $p > 0.05$). A decrease in the age difference between men and women was observed in 2 cases at 400 m freestyle and 400 m integrated swimming. Meanwhile, the characteristic absence of any preference for women over men and vice versa is typical in 12 cases at these prestigious world competitions from 1993 to 2019.

In addition, significant differences in the average speed of distances achieved for different modes of swimming among men and women are indicative of the indicators obtained during long periods of observation of these prestigious competitions. Therefore, this factual material obtained from the information materials shows the general results of reliable data differences at the level of – 0.18 m/s, obtained at Stage II of long-term observation from 1993 to 2019 (men, $x \pm m = 1.78 \pm 0.15$; women, $x \pm m = 1.60 \pm 0.13$; $t = 3.41$, $p < 0.05$).

Conclusions. The obtained data allow us to make the following general conclusions:

a) There is a reliable formation dynamics of swimming physical skills for different ways of swimming depending on the participants' gender difference at the final starts at the World University Games during 1959-1991 for a similar age group – 24-23 years old: (men, $x \pm m = 23.67 \pm 0.84$; women, $x \pm m = 23.35 \pm 1.24$; $t = 0.29$, $p > 0.05$). The largest difference was recorded in relay swimming - 0.27 m/s, then freestyle swimming for short and medium distances – 0.22 m/s, complex swimming in various ways – 0.20 m/s, butterfly swimming – 0.19 m/s, breaststroke – 0.17 m/s, at the distances of medium and steer freestyle swimming – 0.13 m/s. Thus, the lowest indicators were recorded in swimming using the backstroke – 0.05 m/s. The difference between the maximum and minimum is 0.27-0.12 = 0.15 m/s, and the total difference between the average speed at all men's swimming distances compared to that at women's is > 0.17 m/s (men, $x \pm m = 1.81 \pm 0.16$; women, $x \pm m = 1.64 \pm 0.13$; $t = 2.81$, $p < 0.05$);

b) The dynamics of the swimming physical skill formation of young people aged 24-23 (men, $x \pm m = 23.67 \pm 0.84$; women, $x \pm m = 23.35 \pm 1.24$; $t = 0.29$, $p > 0.05$) to overcome different swimming distances depending on the participants' gender difference at the final starts at the World University Games from 1959 to 1991 were determined. The biggest difference is recorded in relay swimming at 50 m – 0.26 m/s, 400 m – 0.22 m/s, 100 m – 0.20 m/s, at distances of steer swimming – 800-1500 m and relay freestyle swimming 4×200 m – 0.18 m/s. Thus, the lowest results were recorded in swimming at distances of 200 m – 0.13 m/s. Therefore, the difference between the maximum and minimum is respectively: 0.26 m/s - 0.13 m/s = 0.13 m/s, and the total difference is 0.17 m/s (men, $x \pm m = 1.81 \pm 0.16$; women, $x \pm m = 1.64 \pm 0.13$; $t = 2.81$, $p < 0.05$);

c) The dynamics of the swimming skill formation for different strokes determined depending on the gender of swimmer-medalists at the finals, who were almost of the same age group, i.e., 22 years old (men, $x \pm$

$m = 22.05 \pm 0.52$; women, $x \pm m = 21.71 \pm 0.47$; $t = 0.02$, $p > 0.05$) at the World Universiade in 1993-2019. The biggest difference was recorded in freestyle short and medium distance swimming – 0.22 m/s, butterfly – 0.21 m/s, relay swimming – 0.20 m/s, backstroke – 0.19 m/s, breaststroke – 0.18 m/s, complex swimming – 0.16 m/s; the smallest difference was in the free-style floating swimming – 0.14 m/s. Therefore, the difference between the maximum and minimum average swimming speeds are: $0.22 \text{ m/s} - 0.14 \text{ m/s} = 0.08 \text{ m/s}$, and the total difference is 0.18 m/s (men, $x \pm m = 1.78 \pm 0.15$; women, $x \pm m = 1.60 \pm 0.13$; $t = 3.41$, $p < 0.05$);

d) The dynamics of the physical swimming skill formation at different distances is thoroughly investigated, depending on the gender of the swimmer-medalists, who were almost 22 years old (men, $x \pm m = 22.05 \pm 0.52$; women, $x \pm m = 21.71 \pm 0.47$; $t = 0.02$, $p > 0.05$) swimmer-medalist during the final races at the World Universiade during 1993-2019. The biggest difference was recorded at 50 m – 0.24 m/s, 100 m – 0.20 m/s, 200 m – 0.17 m/s, 400 m – 0.19 m/s; the smallest difference was observed in the marathon swimming – 0.16 m/s, steer swimming – 800-1500 m and freestyle marathon swimming: $4 \times 200 \text{ m} - 0.14 \text{ m/s}$. Therefore, the difference between the maximum and minimum average speed of swimming is: $0.24 \text{ m/s} - 0.14 \text{ m/s} = 0.10 \text{ m/s}$, and the total difference is also more than –0.18 m/s (men, $x \pm m = 1.78 \pm 0.15$; women, $x \pm m = 1.60 \pm 0.13$; $t = 3.41$, $p < 0.05$);

e) The obtained results will make a significant scientific and methodological contribution to the further improvement of the system of physical education and sports in a gender-sensitive approach. The implementation of these results may improve the performance of the strongest swimmers in prestigious competitions, which are the summer swimming finals at the World Universiade, as during the Stage I from 1959 to 1991 and during Stage II of their modern implementation during 1993-2019. This study shows in detail the past and current state of athlete skills among young people of all ages and genders over a long period of gradual development and opportunities for their improvement in performers throughout life.

Further research in the chosen direction should focus on the study of the characteristics of gender differences among the strongest swimmers during the next European Championships and World Championships, which is important to know before the next Olympic Games.

Thus, research on the opportunities available to young people of all age groups and genders before developing swimming skills will determine the degree of any proper and reliable level of dominance in men's swimming over women. It is possible to determine and carefully evaluate the dynamics of achievement indicators both in the previous years and at the present stage of the appropriate scientific and methodological support for the development of physical swimming skill improvement among young people of all age groups and gender during periods of professional training and further possible person's improvement during life.

Conflicts of interest – The authors do not have any conflicts of interest to declare.

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