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THE EVOLUTION OF A ROMANIAN SWIMMER OVER A 4-YEAR PERIOD

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Abstract

Aim. This paper is a case study that consisted in following the evolution of a Romanian swimmer, trained by the author of this article, during 4 years, in the period 2020-2024, from the age of 10 to 14 years old.

Methods. We followed his evolution, both from the results obtained at the swimming competitions point of view, as well as his physical development with the help of somatic and functional indices, such as: weight, blood pressure, heart rate, oxygen saturation, fat mass, muscle mass, body mass index, height. The research methods used were: literature review, case study, mathematical statistics method, graphical representation method. We wanted to see if his physical development would be reflected in his athletic performance in swimming competitions.

Results. During this period, the subject went through 3 age categories, namely children, cadets and Juniors 2 and won 33 National Champion titles. He made steady and significant progress in all the swimming events that he participated in. For example, in the 50-meter backstroke he recorded a time drop of 6.85 seconds and in the 50-meter butterfly he recorded a time drop of 6.65 seconds, in the analyzed period. He also registered a significant increase in height, namely 14 centimeters, and his muscle mass increased constantly throughout the analyzed period, from 46.5% to 55%. Following and recording a swimmer's sports career is of great importance for any coach. In order to increase an athlete's chances of success, it is necessary to have a good planning and this can only be achieved by means of a detailed recording of his entire sports career. The importance and value of this is well-known worldwide, but perhaps less often this written record is made for young athletes.

Conclusions. This paper highlights the fact that it is beneficial for an athlete's performance to keep track of his progress and also provides useful data and information for people interested in swimming, in particular, as well as sports in general.

Keywords: Swimming, case study.

Introduction

Competitive swimming is considered a unique sport, given the fact that athletes compete while suspended in a fluid medium and they must propel their bodies pushing against liquid rather than solid substances (Maglischo, 2003). Given this unique feature, it is also very important to know that performance in swimming is influenced by size (Kjendlie & Stallman, 2011). For example, a taller swimmer will generally swim faster because larger propelling sizes better the propelling efficiency and lower the stroke rate, thus creating a more energy efficient mode of swimming (Kjendlie & Stallman, 2011). Strzala and Tyka (2009) also stated that body size has a significant influence on swimming results.

The importance of anthropometric characteristics for swimmers' performance has been highlighted in other research articles for many years. For example, in the article *Analysis of performance of prepubertal swimmers assessed from anthropometric and bio-energetic characteristics* (Duché et al., 1993) they discovered that even in young boys, anthropometric characteristics are important in swimming performance. Another article that studied the relationship between somatic and physical characteristics and swimming performance is *Somatic and Physical Traits Affecting Sprint Swimming Performance in Young Swimmers* (Geladas, Nassis & Pavlicevic, 2005). In that paper, the authors concluded that 100 m freestyle performance can be partially explained by anthropometry and physical capacity tests in young swimmers. Akşit et al. (2017) believes that "although performance and success in elite swimmers depend on various factors, physical parameters (i.e., body height, body mass and somatotype characteristics) are also determinants of swimming performance". Therefore, we believe that it is very important for a swimmer's career to monitor their physical development. This could predict, to some extent, the performances obtained in future competitions. We can say that the somatic and functional indices, the physical development of an athlete are closely related to the performances they achieve and can be a determining factor. Thus, we believe it is useful for any coach of a high-performance athlete to follow and take into account all these aspects, not just strictly competition performances. The coach must constantly stay in touch with the sports doctor and create an interdisciplinary team around the athlete, together with other specialists, to achieve the desired results.

Other authors believe that "although anthropometry may play an important role in performance, the interaction of these traits appears to be complex, suggesting that other factors may be more important in determining performance outcomes" (Ruiz-Navarro et al., 2025).

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Methods

The research methods used were the following: literature review, case study, mathematical statistics method, graphical representation method.

Participants

The participant in this case study was a Romanian male swimmer born in February 2010. The study took place over a period of 4 years, between 2020 and 2024. At the beginning of the study, he was 10 years and 7 months old and at the end of the study, he was 14 years and 9 months old. This athlete was chosen because he was a multiple medalist at all the National Championships he participated in. During the 4 years of study, he obtained 33 National Champion titles, 17 National Vice Champion titles, 12 3rd places at the National Championships. He also set 16 national records in the 25-meter pool and 7 national records in the 50-meter pool. Therefore, being a perspective swimmer of our country, we wanted to follow his evolution, both from the point of view of the results obtained at the swimming competitions, as well as his physical development and somatic and functional indices. We believe that this analysis provides relevant and interesting information for all those interested in the sport of swimming and beyond.

Procedure

The subject we chose was observed from the age of 10 because, in Romania, this is the age when they can participate for the first time in a National Championship. First of all, we wanted to follow the evolution of his performances during his participation in the National Championships of Romania, as well as in other competitions approved by the Romanian Swimming and Modern Pentathlon Federation. We decided to choose these competitions for our analysis, taking into account the accuracy of the times recorded by the electronic timing system used in them. We wanted to see if the athlete would record a constant decrease in times during the 4 years of study.

Secondly, we followed the physical evolution of the athlete with the help of some somatic and functional indices such as: weight, blood pressure, heart rate, oxygen saturation, fat mass, muscle mass, body mass index, height. This was achieved through the periodic measurements necessary to obtain the sports medical visa, in an accredited medical office. The measurements were made by a sports medicine doctor. We wanted to see if his physical development would be reflected in his athletic performances in competitions.

Results

During the mentioned period, we analyzed 11 swimming competitions in which the subject participated. Also, we gather information from 7 medical check-ups done by a sports medicine doctor.

The competitions we included in our study were: National Championship for Children 10-11 years old (October 2020), National Championship for Children 10-11 years old (June 2021), National Polyathlon Championship for Children 10-11 years old (December 2021), Regional Stage of the National Championship - Cadets 12-14 years old (April 2022), National Cadets Championship (June 2022), Andrei Nicolescu Cup - 4th Edition (October 2022), National Cadets Championship 12-14 years old - short course (December 2022), Regional Stage of the National Championship - Cadets 12-14 years old (March 2023), National Championship - Cadets 13-14 years old (July 2023), Andrei Nicolescu Cup 5th Edition (October 2023), National Short Course Championship - Cadets 13-14 years old (December 2023), National Championship Seniors, Youth and Juniors I-II (April 2024), National Championship Seniors, Youth and Juniors I-II, 25m Pool (November 2024). As we have already specified, we chose only the national championships, as well as the official competitions recognized by the Romanian Swimming Federation for the accuracy of the recorded results. It is also worth mentioning that, due to the COVID-19 pandemic, the athlete participated in only one competition in 2020.

Considering the fact that the athlete participated in competitions in both the 50 m and 25 m pools, we have illustrated separately, for the two pool lengths, the results recorded by him.

Next, we present the progress made by the athlete in the 50 m and 100 m events in a 50 m pool (Table 1):

Table 1. Results in the 50 m and 100 meters events, in a 50-meter pool (long course)

Date / Event	50m butterfly	50m backstroke	50m breaststroke	50m freestyle	100m butterfly	100m backstroke	100m breaststroke	100m freestyle
10.2020	00:33:14	00:35:09	00:40:57	-	-	-	-	01:08:04
06.2021	00:30:57	-	-	-	-	01:11:42	01:22:04	01:01:70
12.2021	00:30:33	00:31:34	00:35:63	00:27:40	-	-	-	-
04.2022	00:29:11	-	-	-	-	01:05:74	-	-
06.2022	00:28:57	-	-	00:26:42	01:03:69	01:06:12	01:15:79	00:57:54
10.2022	-	00:29:14	-	00:25:86	-	01:03:46	-	00:57:68
03.2023	-	-	-	-	-	01:04:31	-	00:57:67
07.2023	-	-	-	00:25:80	01:01:28	01:02:03	01:12:07	00:56:72
10.2023	-	00:28:83	-	00:25:96	-	01:01:98	-	00:57:10
04.2024	00:27:38	00:28:68	00:32:80	00:25:86	01:01:86	01:01:94	01:12:32	-
10.2024	00:26:49	00:28:24	-	00:25:32	-	01:00:96	-	-

During the analyzed period, we observe significant progress in all the events in which the athlete participated, namely: in the 50 m butterfly 6.65 seconds, in the 50 m backstroke 6.85 seconds, in the 50 m breaststroke 7.77 seconds, in the 50 m freestyle 2.08 seconds, in the 100 m butterfly 1.83 seconds, in the 100 m backstroke 10.56 seconds, in the 100 m breaststroke 9.72 seconds, and in the 100 m freestyle 10.94 seconds. Considering that these are short events, of 50 m and 100 m, these improvements in the times obtained are significant.

In Table 2 we present the progress made by the athlete in the 200 m and 400 m events in a 50 m pool:

Table 2. Results in the 200 m and 400 meters events, in a 50-meter pool (long course)

Date / Event	200m backstroke	200m breaststroke	200m freestyle	200m individual medley	400m freestyle
12.2021	-	-	02:11:60	02:36:05	-
04.2022	-	-	02:11:17	02:26:15	-
06.2022	02:21:48	02:43:73	-	02:24:84	04:31:90
03.2023	-	-	-	02:20:54	04:28:07
07.2023	02:16:07	02:43:08	02:07:18	02:18:67	-
04.2024	02:15:13	-	-	-	-

Regarding the 200 m and 400 m events, we observe a progress of the subject of our study as follows: in the 200 m backstroke 6.35 seconds, in the 200 m breaststroke only 65 hundredths of a second, in the 200 m freestyle 4.42 seconds, in the 200 m individual medley 17.38 seconds, and in the 400 m freestyle 3.83 seconds.

On average, the swimmer made a progress of 5.83 seconds in the 50 m events, 8.26 seconds in the 100 m events and 7.2 seconds in the 200 m events. These represent substantial improvements in the times achieved in competitions (Figure 1).

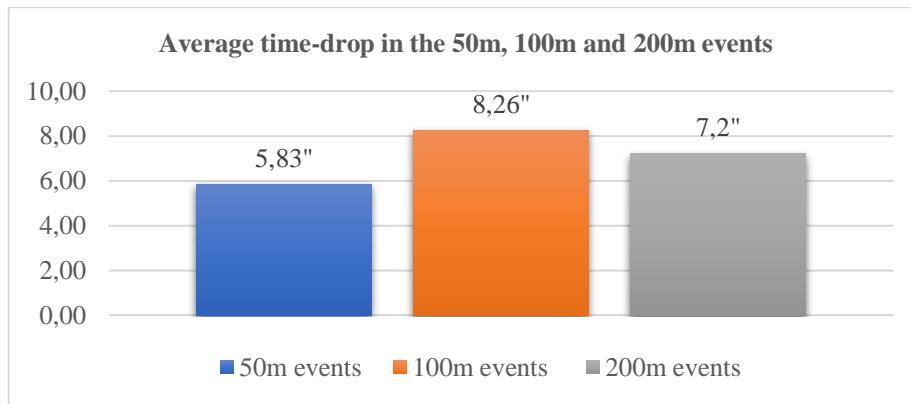


Figure 1. Average time-drop in the 50m, 100m and 200 m events

Further, we present the progress made by the swimmer, in the 50 m and 100 m events, in a 25 m pool (Table 3):

Table 3. Results in the 50 m and 100 meters events, in a 25-meter pool (short course)

Date / Event	50m freestyle	100m butterfly	100m backstroke	100m breaststroke	100m individual medley
12.2022	00:25:44	01:01:11	01:01:15	01:10:80	01:02:93
12.2023	00:24:99	01:00:20	01:01:02	01:09:37	01:01:43
11.2024	00:25:01	00:59:53	00:58:78	-	00:59:73

Our athlete has competed in the 25 m pool since December 2022. We have chosen to present in the table above only the results from the events that the subject swam at least twice, in order to be able to make a comparison and see if there has been any progress. The progress recorded by him was: in the 50 m freestyle 43 hundredths of a second, in the 100 m butterfly 1.58 seconds, in the 100 m backstroke 2.37 seconds, in the 100 m breaststroke 1.43 seconds, in the 100 m individual medley 3.2 seconds.

In Table no. 4, we present the progress made by the swimmer, in the 200 m and 400 m events, in a 25 m pool:

Table 4. Results in the 200 meters events, in a 25-meter pool (short course)

Date / Event	200m backstroke	200m breaststroke	200m freestyle	200m individual medley
12.2022	02:15:54	02:32:68	02:03:23	02:16:71
12.2023	02:16:63	02:32:08	02:02:70	02:13:66
11.2024	02:06:16	-	-	-

Regarding the subject's participation in the 200-meter events, in a 25-meter pool, he progressed as follows: in the 200 m backstroke 9.38 seconds, in the 200 m breaststroke 60 hundredths, in the 200 m freestyle 53 hundredths, and in the 200 m individual medley 3.05 seconds.

We can thus conclude that the subject made progress in absolutely all the swimming events in which he participated, both in the 50 m and 25 m pools.

Another direction of our study was to follow the athlete's evolution in terms of somato-functional development, using somatic and functional indices (Table no. 5). These measurements were performed during medical check-ups by a sports medicine doctor, in an authorized clinic.

Table 5. Somatic and functional indices

Date / Index	Weight (kg)	Ideal weight (%)	BP (mmHg)	HR (bpm)	sO2 (%)	Fat Mass (%)	Muscle Mass (%)	BMI	Height (cm)	Age (y,m)
09.2020	56	59.21	127/65	65	98	9.9	46.5	20.6	165	10,7
05.2021	58	61.39	128/66	63	99	9.8	47.2	20.5	168	11,3
05.2022	59.9	64.12	129/63	60	98	9.2	48.1	20.4	171.5	12,3
11.2022	61.8	64.87	122/67	55	98	10.2	49	20.8	172.5	12,9
05.2023	65.2	67.75	125/68	53	99	11.1	51.4	21	176	13,3
02.2024	67.4	69	126/61	65	98	10	54.5	21.5	177	14
09.2024	70	70	125/62	62	99	9.5	55	21.8	179	14,7

We can observe a significant increase in height, namely 14 cm. The subject also recorded a weight gain of 10.79 kg. In 6 out of the 7 measurements, he was below the ideal weight, but this is normal considering that he is a growing athlete, going through puberty. Body mass index was consistently in the optimal category. Blood pressure was similar in all measurements. Heart rate was between 53 and 65. Blood oxygen saturation was 98-99%. An important observation is that his muscle mass increased steadily throughout the analyzed period, from 46.5% to 55%. Thus, we observe that the subject's morpho-functional development was also reflected in his progress in competitions.

Conclusions

The paper highlighted the progress made by a high-performance Romanian swimmer over a 4-year period. He recorded significant improvements in all the events he participated in. He also went through major changes in somatic indices, such as height or weight. The percentage of muscle mass also increased significantly, by 8.5%.

A limitation of this paper is represented by the fact that this is a case study with a single participant, so it is difficult to generalize the findings. Another limitation is the impossibility of demonstrating to what extent somatic and functional indices positively influenced sports performance in the pool. However, taking into account the vast existing literature, we can state that these indices do influence swimmers' results.

More research is still needed regarding the influence of somatic and functional indices on the performances achieved by swimmers. The present case study brings additional information on this topic.

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