

Study regarding the development of the front crawl and backstroke swimming techniques in children aged 7-10

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Abstract

Background: The biggest advantage of swimming is that the muscles and joints can move without the need to bear weight, thus the tension is limited which reduces most risks of injury. The water environment allows freedom of movement and exercise choices that are impossible on land. *Aim:* The objective of our study is to test the hypothesis that the execution of a well designed training plan will result into the improvement of the technique and swimming speed in the front crawl and backstroke styles for the participants. *Methods:* 16 children have been selected, 10 boys and 6 girls. Their mean age (8.4 ± 0.96) is between 7 and 10. We chose 5 specific tests in order to evaluate our hypothesis. *Results:* The final tests demonstrate that both performance and technique have been considerably improved as a result of the training plan. *Conclusion:* After a well designed training plan for a period of 3 months, the group of children experienced a positive change in the quality of their motor skills associated with swimming which improved their technique and performance.

Key words: swimming, progress, backstroke, front crawl, freestyle swimming

Rezumat

Introducere: Cel mai mare avantaj al înotului este că mușchii și articulațiile se pun în mișcare fără a fi nevoite să suporte vreo greutate, reducându-se astfel tensiunea care există la nivelul acestora, ceea ce determină un risc minim în ceea ce privesc leziunile sau răniile. Exercițiile în apă permit o libertate de mișcare imposibilă „pe uscat”. Apa permite realizarea de mișcări și posturi care nu se pot realiza în afara ei. *Scopul* studiului nostru este de a verifica dacă prin parcurgerea unui plan de pregătire, se îmbunătățește tehnica și viteza în procedeele craul și spate. *Metode:* Pentru acest studiu am recrutat 16 copii, dintre care: 10 sunt băieți, iar 6 sunt fete. Vârsta subiecților ($8,4 \pm 0,96$) a fost cuprinsă între 7 și 10 ani. Astfel: 3 copii au vârsta de 7 ani, 5 dintre ei au 8 ani, 6 subiecți au 9 ani, iar 2 au vârsta de 10 ani. În vederea realizării cercetării subiecții au fost testați în 5 probe specifice. *Rezultate:* din testările finale reiese faptul că atât performanțele sportivilor au fost îmbunătățite în mod semnificativ, cât și tehnica acestora. *Concluzii:* După parcurgerea programului de antrenament, efectuată pe o perioadă de 3 luni de către o grupă de copii, impactul avut asupra calităților motrice specifice cât și a tehnicii, a fost unul pozitiv, toți subiecții reușind să-și îmbunătățească atât tehnica cât și performanțele realizate.

Cuvinte cheie: Înot, consolidare, craul, spate, progres

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Introduction

The water environment allows freedom of movement and exercise choices that can't be executed on land. Furthermore, exercises performed in water have positive psychological effects, because the person is in a playful environment at an optimal temperature that promotes relaxation [1].

In recent years there has been an increase in the number of medical specialists who have recommended swimming as a helpful treatment for various conditions, maladies and health related objectives. These include: asthma, muscle and joint pain, hernias, stress, stimulating growth, controlled weight loss, physical and motor disabilities, autism. [8]. The regular practice of this sport promotes the elasticity and mobility of lungs.

As a result, lungs are able to capture a large amount of air, which helps the body cells to benefit from a higher oxygen supply. The lungs are elastic organs whose optimal functioning depends on the contraction and relaxation of the rib cage muscles. These muscles tone up and work more efficiently when exercises are performed regularly [6]. The biggest advantage of swimming is that the muscles and joints can move without the need to bear weight and, therefore, the risks of injury are reduced.

A clear example would be a person whose daily demands, to which the force of gravity also contributes considerably, have a major impact on the joints, especially those of the knees and hips. In water, this does not apply because the force of gravity has different effects on the body compared to the exercising on land [6-8]. Through this study, we want to present the results of a well designed training program that lasted for a period of 3 months. We aimed to improve both the performance and technique of front crawl and backstroke swimming for its participants. We assume that a group of advanced children that undergoes such a programme will develop both the specific motor skills and the necessary technique.

Methods

For this paper we used the GraphPad Prisme 6 statistical analysis software and the t pairing test in order to analyze the differences between the samples

in both the initial and the final testing [3]. This study was conducted in Timișoara, from February to April 2016, and included children from the Fit Factory club in Dumbrăvița. 16 children at an advanced swimming level have been selected, 10 boys and 6 girls. Their age (8.4 ± 0.96) ranges between 7 and 10 years, as following: 3 children aged 7, 5 children aged 8, 6 children aged 9, and 2 children aged 10. The experiment consisted of testing the children before the beginning of a specifically designed 3-month training plan and at the end. The training sessions took place 3 times per week, namely Monday, Wednesday and Friday, and the duration of a session was one hour. In total, there were 38 hours of swimming (please note that all children participated with interest at all the scheduled hours). We chose the following 5 tests:

a) 20m front crawl, head submerged, legs only

In this test, the subjects had to swim as fast as they could for a distance of 20 meters, using only the movements of their legs associated to the front crawl technique. The start was given by the coach after the command: "Attention", followed by the whistle. The best performance in 2 attempts was recorded for each swimmer.

b) 20m backstroke, legs only

In this test, the subjects had to swim as fast as they could for a distance of 20 meters, using only the movements of their legs associated to the backstroke technique. The start was given by the coach after the command: "Attention", followed by the whistle. The best performance in 2 attempts was recorded for each swimmer.

c) 20m front crawl (freestyle)

The children had to swim 20 meters as fast as they could in the front crawl style respecting the technique and movements specific to this style. The start was given by the coach after the command: "Attention", followed by the beep. The best performance in 2 attempts was recorded for each swimmer.

d) 20m backstroke

The children had to swim 20 meters as fast as they could in the backstroke style respecting the technique

and movements specific to this style. The start was given by the coach after the command: "Attention", followed by the beep. The best performance in 2 attempts was recorded for each swimmer.

e) Technical evaluation, front crawl and backstroke
In this test, the swimming technique of the children was analyzed for a distance of 20 meters, both in the front crawl style and in backstroke. The following criteria were taken into consideration when establishing the rating: body position in water, leg movement, arm movement, overall coordination, movement over the water (Table I, II).

Table I. Technical evaluation criteria and format

Evaluation criteria	Points	Rating
Body position on water	2 points	Inadequate (0-4 pct.)
Leg movement	2 points	Adequate (5-6 pct.)
Arm movement	2 points	Good (7-8 pct.)
Overall coordination	2 points	Great (9 pct.)
Movement over the water	2 points	Excellent (10 pct.)

Period	Exercises	Volume/ Break
Week 1	5x20m of: legs only front crawl; crawl 1x1; crawl sliding, legs only backstroke, backstroke 1x1; backstroke sliding.	V-600m B-30 s
Week 2	5x20m of: legs only front crawl; crawl 1x1; crawl marked, legs only backstroke, backstroke 1x1; backstroke marked.	V-600m B-30 s
Week 3	100m: legs front crawl/ legs only backstroke; 5x20m: front crawl with 1 arm/ backstroke with 1 arm; 5x40m: front crawl sliding/ backstroke sliding.	V-800m B-30 s

Week 4	5x20m: legs front crawl/ legs only backstroke; 5x40m: front crawl 1x1/ backstroke 1x1; 100m: front crawl/ backstroke.	V-800 m B-20 s
Week 5	5x20m: front crawl, arms only front crawl/ backstroke sliding, arms only backstroke; 8x10m: front crawl/ backstroke	V-700m B-20 s
Week 6	100m: legs front crawl/ legs only backstroke; 5x20m: front crawl with 1 arm/ backstroke with 1 arm; 5x40m: front crawl sliding/ backstroke sliding.	V-1000m B-1 min
Week 7	5x20m: front crawl 1x1/ backstroke 1x1; 10x20m: front crawl sliding/ backstroke sliding; 5x40m: front crawl/backstroke.	V-1000m B-30 s
Week 8	5x40m: legs front crawl/ legs only backstroke; Pyramid sequence 20-40-60-80-100m: crawl sliding/ backstroke.	V-1100m B-30/45 s
Week 9	5x20m: front crawl/backstroke; 8x40m: front crawl sliding/ backstroke sliding.	V-900m B-30 s
Week 10	5x20m crawl 1x1/ spate 1x1; 8x20m: legs only front crawl, front crawl/ legs only backstroke, backstroke.	V-800m B-1 min
Week 11	5x40m: 1 arm front crawl, front crawl/ 1 arm backstroke, backstroke.	V-800m B-20 s
Week 12	6x20m: legs front crawl/ legs only backstroke; 5x20m: front crawl 1x1, front crawl sliding/ backstroke 1x1, backstroke sliding; 3x20m: front crawl/backstroke.	V-650m B-20s

Table II. Technical evaluation and format

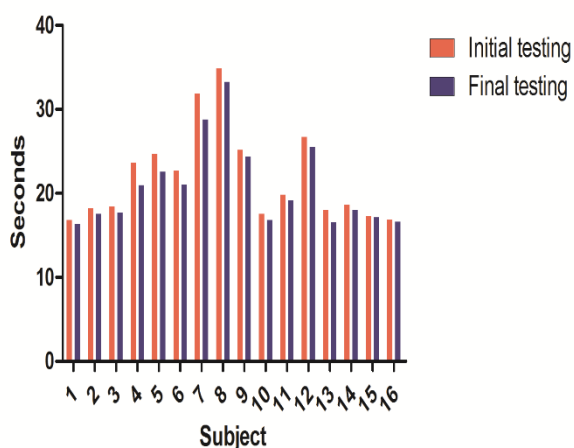


Figure 1. 20m front crawl, head submerged, legs only

At the 20m front crawl, head submerged, legs only test, after analyzing the results, we can see that all subjects have improved their results. Thus, the most important progress was made by subject 7 with 3 seconds. A significant progress was also achieved by S4 with 2.7 seconds. It is worth mentioning that the times have been improved with values between 0.2-3.1 seconds. In terms of absolute value, the best result was obtained by S1 with the time of 16.33 after the final test. The difference in this sample is significant ($p=0.0001$).

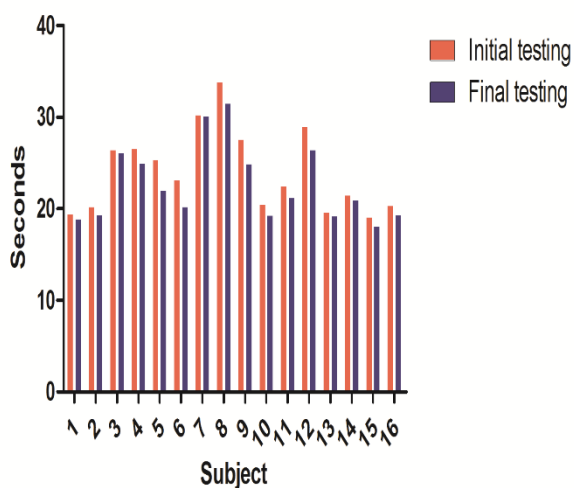


Figure 2. 20m backstroke, legs only

Initially, the measured values of the 20m backstroke, legs only test were between 18.99 and 33.81 seconds, while the final values ranged between 18 and 31.44 seconds. Thus, subject 5 improved his result by 3.33 seconds, very close to this value were S6, S9, S12 with

improvements of 2.98s, 2.7s and 2.52s, respectively. It is worth mentioning that in this test all athletes have managed to improve their results, and the difference between tests is significant ($p=0,005$)

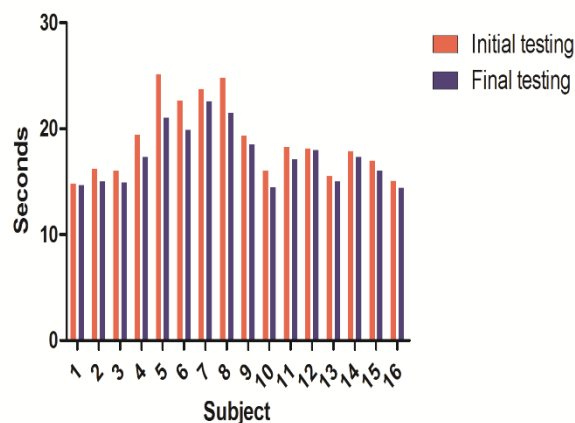


Figure 3. 20m front crawl (freestyle)

The results of test no. 3 (20m front crawl) show us that: S5 had the best performance improvement and managed to improve the time by 4.17 seconds. S8 also progressed with 3.31 seconds, S6 achieved an improvement of 2.66 seconds, S4 showed an improvement of 2.09 seconds.

It is worth mentioning that in this test also, all the subjects improved their performances with values between 0.13 and 4.17 seconds. The most valuable result in terms of time was 14.67 seconds achieved by subject 1. After finding the value of P (0.002), we can say that the difference between the tests is significant.

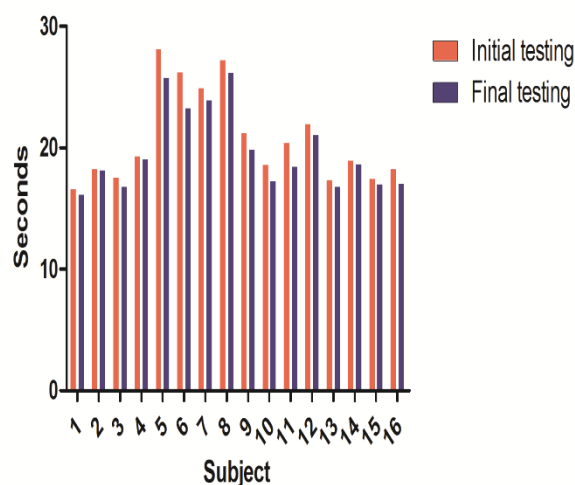


Figure 4. 20m backstroke

After performing the analysis on this sample, in the initial phase the homogeneity obtained was 18.37%, having values between 16.57 and 28.11 seconds. Following the training plan, the values were between 16.1 and 26.15 seconds.

Thus, the most important progress was achieved by S6 with 3.01 seconds; followed by S5 with 2.38 seconds, S11 progressed with 1.98 seconds. As we can see, all athletes have improved their performance, and the most valuable result was achieved by S1, being timed for 16.1 seconds. The difference in this sample is significant, P is equal to 0.0001.

Table III. Technical evaluation results

Sub.	Front Crawl Tech. (Initial)	Front Crawl Tech. (Final)	Backstroke Tech. (Initial)	Backstroke Tech. (Final)
1	Great	Excellent	Good	Excellent
2	Good	Great	Adequate	Good
3	Good	Excellent	Good	Great
4	Adequate	Great	Adequate	Good
5	Adequate	Great	Adequate	Good
6	Good	Great	Inadequate	Good
7	Great	Excellent	Good	Great
8	Inadequate	Good	Good	Great
9	Good	Excellent	Good	Great
10	Adequate	Good	Great	Excellent
11	Good	Great	Adequate	Good
12	Good	Great	Good	Good
13	Great	Excellent	Good	Great
14	Adequate	Good	Good	Great
15	Good	Excellent	Good	Great
16	Great	Excellent	Good	Great

After analyzing the data obtained in the final test for both the initial and final testing, we can see a significant improvement in the participants' technique

Thus, in the initial testing of the front crawl style, we found that: 7 subjects were rated Good, 4 of them scored a rating of Great, 4 subjects succeeded in obtaining an Adequate rating and 1 was rated as Inadequate. After the evaluation at the end of the training program, we note that: 7 subjects have progressed to the Excellent rating, 6 children were rated Great, and the remaining 3 participants

obtained a Good rating. In the backstroke, after the initial assessment, we have the following results: 10 subjects managed to get the Good rating, 4 children were rated Adequate, 1 was rated Great and 1 of the participants was rated Inadequate. After completing the training plan, at the final testing, we have: 8 subjects who progressed to Great, 6 children who obtained the Good rating, and 2 who were able to score a rating of Excellent.

Discussion

The scientific literature already contains studies focusing on maximal swimming speed based on the age and gender of the athletes [5] and on the increase of the front crawl swimming speed for children between the ages of 11 and 13 [2-7]. Similarly to our study, other studies focused on the maximal swimming speed in relation to the age and gender of the athletes and on the increased front crawl swimming speed in children aged 11 - 13 years. Furthermore, a 2005 study demonstrated that swimming speed can be influenced by the somatotype and body composition of the athletes [4].

Conclusion

The analysis of the collected data leads us to the conclusion that our test subjects have progressed as a result of completing the training plan, both technically and in terms of their speed tests results. Thus, after interpreting the results, it can be noticed that each subject managed to improve their results in all their final tests.

At test no.1 (20m front crawl, head submerged, legs only) the times were improved with values between 0.2 and 3.1 seconds. At test no.2, the backstroke performance was improved with values of 0.17-3.33s. Test no. 3 - the 20-meter front crawl resulted into speed improvements between 0.13-4.17s being the test with the most impressive results. At the 20 meters backstroke test, the times were improved with values ranging from 0.09 to 3.01 seconds. In the technical evaluation test, some outstanding results were achieved, with all athletes managing to significantly improve their swimming technique.

The final results show that both the performance of the tests was improved and the improvement differences were significant.

These results confirm the initial hypothesis of this study, according to which, a group of children following a well designed 3 month training plan should see a positive change in the quality of their specific motor skills associated with the tested swimming styles (front crawl, backstroke) to the degree where these changes translate into improvements in speed and technique for those specific swimming styles.

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