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## PERFORMANCE PROGNOSIS BY ESTABLISHING THE PROGRESS RATE IN MORPHOLOGICAL AND FUNCTIONAL TRAINING RACES ON WATER AND DRY LAND OF THE CRAWL SWIMMING EVENT IN JUNIOR CATEGORY

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### Abstract

The paper is intended to systematize the means specific to force preparation and functional effort in professional swimmers of crawl technique on short distances, and to combine them for the purpose of application during the training of cadet and junior swimmers.

The practice during training focuses on morphological and functional evolution of cadet and junior swimmers specialized in crawl swimming races on short distances of 50 and 100 m. According to water and dry land training requirements, the research was initiated based on the individual records from Bucharest National Institute of Sports Medicine (INMS). Based on statistical and mathematical analysis and study, a progress of the research results can be observed, which could take a calculation into the prognosis of the future performances.

**Keywords:** crawl technique, performance, water and dry land training, individual records, prognosis.

### Introduction

It is recommended to apply the specialized and individualized motor plan in order to obtain a progress in morphological and functional performance and in performance in short crawl swimming events, which could represent a continuation of the research and bio-activation at senior level.

**The general purpose of the basic research** is to objectify morphological and functional training by recording the parameters of specific and unspecific training tests.

**The operational goal of the basic research** focuses on recording the data of morphological development and functional capacities obtained during testing at Bucharest National Institute of Sports Medicine (INMS) and also of parameters recorded in races specific to natation training in water and on dry land.

### Specific operational goals:

1. implementing a specific motor training program and an unspecific one on

dry land during the period between the initial testing and the final testing

2. making efficient the main relevant means of the motor program through the final results and performances of the subjects in competitions with the calculation of the progress rate of future performances.

### Hypotheses of the basic experimental research

1. We assume that by recording and analysing the morphological and functional parameters on WEBA SPORT simulator exercises specific to crawl stroke can be done during the planned training of force and power correlated to speed, pace and correction of the paddling move amplitude in crawl style.

2. It is assumed that, based on a motor program of morphological and functional training with specific and unspecific means in water and on dry land, a correlation of the crawl stroke with the speed and pace of advancing on the competition distance in natation-specific speed events can be obtained with the confirmation of the progress by final competition evaluation and INMS recordings.

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**Results Comparative statistical and mathematical analysis, personal contribution, with the average progress rate of the examined subject sample during the experimental research:**

|                           | Pregătire fizică pe uscat NESPECIFICĂ | Pregătire fizică pe uscat SPECIFICĂ WEBA Sport | Morfologic | Capacitatea funcțională | Pregătire fizică SPECIFICĂ în apă | Total                                   |
|---------------------------|---------------------------------------|--|------------|-------------------------|-----------------------------------|---|
| S1                        | 29,63%                                | 41,52%   | 2,86%      | 61,99%                  | 12,02%                            | (29.63+41.52+2.86+61.99+12.02):5=29.60% |
| S2                        | 33,98%                                | 48,57%   | 2,23%      | 57,73%                  | 7,57%                             | (33.98+48.57+2.23+57.76+7.57):5=30.02%  |
| S3                        | 42,93%                                | 51,18%   | 2,92%      | 69,58%                  | 4,22%                             | (42.93+51.18+2.92+69.58+4.22):5=34.17%  |
| S4                        | 48,18%                                | 57,13%   | 3,98%      | 70,84%                  | 5,81%                             | (48.18+57.13+3.98+70.84+5.81):5=37.19%  |
| <b>Total RATA PROGRES</b> | <b>38,68%</b>                         | <b>49,60%</b>                                  | <b>3%</b>  | <b>65%</b>              | <b>7,41%</b>                      | <b>32,07%</b>                           |

The comparative statistical and mathematical analysis of percentage results of the subjects for each testing mode, with the average progress rate of the examined subject sample is:

1. Testing of unspecific physical training on dry land, sample average: 38.68%
2. Testing of specific physical training on dry land with WEBA Sport simulator, sample average: 49.60%
3. Morphological development testing, sample average: 3%:

4. Functional capacity development testing, sample average: 65%

5. Testing of specific physical training in water, sample average: 7.41%

**Total progress rate in specific and unspecific physical training on the examined subject sample: 32.07%**

Calculation of statistical indicators, personal contribution

| Indicatorii statistici la probele de dezvoltare fizică nespecifică                       |                  |          |       |                |          |      |       |        |
|--|------------------|----------|-------|----------------|----------|------|-------|--------|
| Indice   | Testare inițială |          |       | Testare finală |          |      | t     | p      |
|  | $X_i \pm m$      | $\sigma$ | V%    | $X_f \pm m$    | $\sigma$ | V%   |       |        |
| Tracțiuni  | 5,5±0,18         | 5,25     | 1,04  | 10,75±0,10     | 10,05    | 1,02 | 5,86  | ≥ 0,05 |
| Abdomen (30 sec)   | 21,5±0,31        | 4,25     | 5,05  | 25,75±0,19     | 5,09     | 5,05 | 12,75 | ≥ 0,05 |
| Alergare 50m (sec)   | 7,8±0,04         | 0,16     | 1,9   | 8,20±0,03      | 0,11     | 2,31 | 3,93  | ≥ 0,05 |
| Săritura în lungime(cm)  | 167,5±0,36       | 11,8     | 0,98  | 179,3±0,30     | 1,34     | 0,75 | 31,7  | ≥ 0,05 |
| Indicatorii statistici la probele funcționale  |                  |          |       |                |          |      |       |        |
| Indice   | Testare inițială |          |       | Testare finală |          |      | t     | p      |
|  | $X_i \pm m$      | $\sigma$ | V%    | $X_f \pm m$    | $\sigma$ | V%   |       |        |
| Frecvența respiratorie   | 18,25±0,30       | 2        | 8,2   | 16,25±0,24     | 1,07     | 6,65 | 2,9   | ≥ 0,05 |
| Testul Ruffier   | 7,25±0,24        | 5,95     | 8,16  | 1,3±0,19       | 0,80     | 8,23 | 11,26 | ≥ 0,05 |
| Frecvența cardiacă   | 62,5±0,36        | 2,25     | 1,89  | 60,25±0,29     | 1,34     | 1,63 | 6,96  | ≥ 0,05 |
| Mobilitate coxo-femurală (cm)  | 3,25±0,27        | 5,5      | 2,66  | 8,75±0,24      | 1,07     | 2,72 | 9,5   | ≥ 0,05 |
| Indicatorii statistici la probele de dezvoltare fizică specifică pe simulator WEBA Sport |                  |          |       |                |          |      |       |        |
| Indice   | Testare inițială |          |       | Testare finală |          |      | t     | p      |
|  | $X_i \pm m$      | $\sigma$ | V%    | $X_f \pm m$    | $\sigma$ | V%   |       |        |
| Putere   | 6,75±0,28        | 5,75     | 1,17  | 12,5±0,25      | 10,648   | 1,70 | 17,25 | ≥ 0,05 |
| Forța relativă   | 16±0,15          | 7        | 2,28  | 23±0,11        | 10,62    | 2,16 | 21    | ≥ 0,05 |
| Viteză medie   | 0,85±0,14        | 0,5      | 1,7   | 1,35±0,08      | 0,79     | 1,5  | 2,9   | ≥ 0,05 |
| Cadență  | 109±0,29         | 9,5      | 11,47 | 99,5±0,22      | 8,67     | 10,8 | 28,5  | ≥ 0,05 |
| Indicatorii statistici la testele de pregătire fizică specifică                          |                  |          |       |                |          |      |       |        |
| Indice   | Testare inițială |          |       | Testare finală |          |      | t     | p      |
|  | $X_i \pm m$      | $\sigma$ | V%    | $X_f \pm m$    | $\sigma$ | V%   |       |        |
| 4x25 m craul   | 14,725±0,10      | 1,475    | 3,26  | 13,25±0,09     | 0,35     | 3,01 | 4,66  | ≥ 0,05 |
| 4x50 m craul   | 32,475±0,90      | 2,86     | 1,45  | 29,615±0,10    | 0,30     | 1,20 | 5,92  | ≥ 0,05 |
| 2x 100 m craul   | 66,35±0,34       | 5,02     | 0,57  | 61,33±0,32     | 1,29     | 0,46 | 18,4  | ≥ 0,05 |

LEGENDĂ: \* p - cel din tabelul lui Student la pragul de semnificație ≥ 0,05 , t ≥ 2,09

\*\* t - calculat între cele două testări, ti și tf

**Discussions** The statistical indicators in unspecific physical development tests on the examined sample recorded as follows:

1. Pull-ups:
    - Average value in initial testing of 5.5, and in the final testing of 10.75.
    - The average progress recorded between the two tests being of 5.25.
    - The standard deviation in this control examination between the two tests was of 10.05.
    - Tf-Student test result for this examination was of 5.86, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  2. Crunches (30 sec.):
    - Average value in initial testing 21.5, and in the final testing of 25.75.
    - The average progress recorded between the two tests being of 4.25.
    - The standard deviation in this control examination between the two tests was of 5.09.
    - Tf-Student test result for this examination was of 12.75, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  3. Running 50m (sec.)
    - Average value in initial testing 7.8, and in the final testing of 8.2.
    - The average progress recorded between the two tests being of 0.16 sec.
    - The standard deviation in this control examination between the two tests was of 5.09 sec.
    - Tf-Student test result for this examination was of 3.93, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  4. Long jump (cm)
    - Average value in initial testing 167.5 cm, and in the final testing of 179.3cm.
    - The average progress recorded between the two tests being of 11.8 cm.
    - The standard deviation in this control examination between the two tests was of 5.09.
    - Tf-Student test result for this examination was of 31.7, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  5. Respiratory rate (breaths/minute)
    - Average value in initial testing 18.25, and in the final testing of 16.25.
    - The average progress recorded between the two tests being of 2 breaths.
  - The standard deviation in this control examination between the two tests was of 1.07.
  - Tf-Student test result for this examination was of 2.9, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
6. Ruffier tests (values/marks)
    - Average value in initial testing 7.5, and in the final testing of 1.3.
    - The average progress recorded between the two tests being of 5.95.
    - The standard deviation in this control examination between the two tests was of 0.80.
    - Tf-Student test result for this examination was of 11.26, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  7. Heart rate (beats/minute)
    - Average value in initial testing 62.5, and in the final testing of 60.25.
    - The average progress recorded between the two tests being of 2.25 breaths.
    - The standard deviation in this control examination between the two tests was of 1.34.
    - Tf-Student test result for this examination was of 6.95, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  8. Hip mobility (cm)
    - Average value in initial testing 3.25, and in the final testing of 8.75.
    - The average progress recorded between the two tests being of 5.5 cm.
    - The standard deviation in this control examination between the two tests was of 1.07.
    - Tf-Student test result for this examination was of 9.5 for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  9. Power (W)
    - Average value in initial testing 6.75, and in the final testing of 12.5.
    - The average progress recorded between the two tests being of 5.75 W.
    - The standard deviation in this control examination between the two tests was of 10.648.
    - Tf-Student test result for this examination was of 17.25, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
  10. Relative force (N)

- Average value in initial testing 16, and in the final testing of 23.
- The average progress recorded between the two tests being of 7 N.
- The standard deviation in this control examination between the two tests was of 10.62.
- Tf-Student test result for this examination was of 21, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
- 11. Average speed (km/h)
  - Average value in initial testing 0.85, and in the final testing of 1.35.
  - The average progress recorded between the two tests being of 0.5 km/h.
  - The standard deviation in this control examination between the two tests was of 0.79.
  - Tf-Student test result for this examination was of 2.9, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
- 12. Pace (paddling rate/100m)
  - Average value in initial testing 109, and in the final testing of 99.5.
  - The average progress recorded between the two tests being of 9.5 paddling rate/100m.
  - The standard deviation in this control examination between the two tests was of 8.76.
  - Tf-Student test result for this examination was of 28.5, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
- 13. Index 4x 25m crawl with starting break after 1.30 minutes
  - Average value in initial testing 14.72, and in the final testing of 13.25.
- The average progress recorded between the two tests being of 3.26 seconds.
- The standard deviation in this control examination between the two tests was of 0.35.
- Tf-Student test result for this examination was of 4.66, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
- 14. Index 4x 50m crawl with starting break after 2 minutes
  - Average value in initial testing 32.47, and in the final testing of 29.61.
  - The average progress recorded between the two tests being of 2.88 seconds.
  - The standard deviation in this control examination between the two tests was of 0.30.
  - Tf-Student test result for this examination was of 5.92, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.
- 15. Index 2x 100m crawl with starting break after 3 minutes
  - Average value in initial testing 66.35, and in the final testing of 61.33.
  - The average progress recorded between the two tests being of 5.02 seconds.
  - The standard deviation in this control examination between the two tests was of 1.29.
  - Tf-Student test result for this examination was of 18.4, for  $p > 0.05$ , a value greater than t-table, therefore, the null hypothesis is dismissed.

**Conclusion Prize record with results in competition**, in 50m freestyle and 100m freestyle swimming events in 2017, 2018 and February 2019, expressed in seconds.

Competition testing in 50m freestyle and 100m freestyle individual swimming event, 2017, 2018, 2019, personal experiment

| ANUL     | 2017                  |                        | 2018                   |                       | 2019                  |                       |
|----------|-----------------------|------------------------|------------------------|-----------------------|-----------------------|-----------------------|
| SUBIECTI | Proba 50 m liber/sec. | Proba 100m liber/ sec. | Proba 50 m liber/ sec. | Proba 100m liber/sec. | Proba 50 m liber/sec. | Proba 100m liber/sec. |
| S1       | 29                    | 63                     | 28                     | 60                    | 26.9                  | 58                    |
| S2       | 31                    | 66                     | 29                     | 61                    | 28.12                 | 60                    |
| S3       | 34                    | 72                     | 32                     | 69                    | 30                    | 68                    |
| S4       | 35                    | 81                     | 33                     | 74                    | 32                    | 72                    |

S= experimental subject

Mathematical analysis for the four subjects in 50m freestyle and 100m freestyle events from 2017 to 2018:

1. 1<sup>st</sup> subject, 50m freestyle event, progress of 1 sec., 100m freestyle event, progress of 3

seconds.

2. 2<sup>nd</sup> subject, 50m freestyle event, progress of 2 sec., 100m freestyle event, progress of 5 seconds.
3. 3<sup>rd</sup> subject, 50m freestyle event, progress of 2 sec., 100m freestyle event, progress of 3

- seconds.
- 4<sup>th</sup> subject, 50m freestyle event, progress of 2 sec., 100m freestyle event, progress of 7 seconds.

Mathematical analysis for the four subjects in 50m freestyle and 100m freestyle events from 2017 to 2019:

- 1<sup>st</sup> subject, 50m freestyle event, progress of 2.1 sec., 100m freestyle event, progress of 5 seconds.

- 2<sup>nd</sup> subject, 50m freestyle event, progress of 2.88 sec., 100m freestyle event, progress of 6 seconds.
- 3<sup>rd</sup> subject, 50m freestyle event, progress of 4 sec., 100m freestyle event, progress of 4 seconds.
- 4<sup>th</sup> subject, 50m freestyle event, progress of 3 sec., 100m freestyle event, progress of 9 seconds.

#### Analysis of the progress rate individually calculated as percentage for each subject – experiment

| ANUL                      | PROGRES 2017-2018 |                  | PROGRES 2017-2019 |                 | Progres 2018-2019 |                  |
|---------------------------|-------------------|------------------|-------------------|-----------------|-------------------|------------------|
|                           | 50 m liber/<br>%  | 100m liber/<br>% | 50 m liber/<br>%  | 100m<br>liber/% | 50 m<br>liber/%   | 100m<br>liber/ % |
| S1                        | 3.44              | 4.76             | 7.25              | 7.90            | 3.92              | 3.33             |
| S2                        | 6.45              | 7.57             | 9.29              | 9.09            | 3.03              | 1.63             |
| S3                        | 5.88              | 4.16             | 11.75             | 5.55            | 6.25              | 1.45             |
| S4                        | 5.71              | 8.64             | 8.57              | 11.11           | 3.03              | 2.7              |
| <b>Medie<br/>eșantion</b> | <b>5.37</b>       | <b>6.28</b>      | <b>9.21</b>       | <b>8.41</b>     | <b>4.05</b>       | <b>2.27</b>      |

- 1<sup>st</sup> subject, from 2017 to 2018, the progress rate in 50m freestyle event was of 3.44%. From 2017 to 2019, the progress rate in 50m freestyle event was of 7.25%. 1<sup>st</sup> subject, from 2017 to 2018, the progress rate in 100m freestyle event was of 4, 76%. From 2017 to 2019, the progress rate in 100m freestyle event was of 7.9%.

- 2<sup>nd</sup> subject, from 2017 to 2018, the progress rate in 50m freestyle event was of 6.45%. From 2017 to 2019, the progress rate in 50m freestyle event was of 9.29%. 1<sup>st</sup> subject, from 2017 to 2018, the progress rate in 100m freestyle event was of 7.57%. From 2017 to 2019, the progress rate in 100m freestyle event was of 9.09%.

- 3<sup>rd</sup> subject, from 2017 to 2018, the progress rate in 50m freestyle event was of 5.88%. From 2017 to 2019, the progress rate in 50m freestyle event was of 11.75%. 1<sup>st</sup> subject, from 2017 to 2018, the progress rate in 100m freestyle event was of 4.16%. From 2017 to 2019, the progress rate in 100m freestyle event was of 5.55%.

- 4<sup>th</sup> subject, from 2017 to 2018, the progress rate in 50m freestyle event was of 5.71%. From 2017 to 2019, the progress rate in 50m freestyle event was of 8.57%. 1<sup>st</sup> subject, from 2017 to 2018, the progress rate in 100m freestyle event was of 8.64%. From 2017 to 2019, the progress rate in 100m freestyle event was of 11.11%.

#### Analysis of the progress rate calculated as percentage per sample group for 2017-2018

- In 50m freestyle event, it is **5.37%**.
- In 100m freestyle event, it is **6.28%**.

#### Analysis of the progress rate calculated as percentage per sample group for two years, i.e. 2017-2019.

- In 50m freestyle event, it is **9.21%**.

- In 100m freestyle event, it is **8.41%**.

#### Confirmation of hypotheses of the carried out experimental research

- Based on the records of the basic research and on the analysis of morphological and functional parameters specific to crawl stroke obtained by using WEBA Sport simulator, corroborated with the results obtained in the specific water races, a progress rate was ascertained, both individually and in group, based on statistical and mathematical processing, in which “t<sub>f</sub>” is  $\geq$  than t-Student at significance threshold  $\geq 0.05$ , which confirms the 1<sup>st</sup> hypothesis.

- It was ascertained that the motor program proposed for morphological and functional training with specific and unspecific means in water and on dry land applied as a result of the initial tests done at INMS during a phased period of six months, both individually and in group, has proven to be efficient after reviewing the results obtained in the tested races with regard to the correction of the technique in crawl stroke correlated to speed and pace in crawl technique on competition distance, the speed races proving to be efficient and confirming the progress as a result of the final test done at INMS, confirming the 2<sup>nd</sup> hypothesis (Annex no. 3).

- The participation in national competition from 2017 to 2018 in which the training program proposed by the author in collaboration with the coach of Baracuda Campina Pre-Olympic Centre has confirmed results obtained with improved performances, and in 2019, as a result of continuing the previous physical training on dry land with WEBA Sport equipment and in water, the results improved with regard to performance which corresponded to the 2<sup>nd</sup> training stage, with a progress rate which recommends the use of the approached



program so the a **prognosis** can be made towards high performance at the level of **young and senior** category.

### References

- Alexe N., Totescu A., 1973, Planificarea antrenamentului sportiv, Centrul de Cercetări pentru Problemele Sportului, Ed. INMSB, București, p.53.
- Arellano R., Brown P., Cappaert J., NELSON R.C., 1994, Analysis of 50-, 100-, and 200-m Freestyle Swimmers at the 1992 Olympic Games. *J Appl Biomech*, 1994; 10: 189-199.
- Bolboacă S. D., 2018, Mathematics, Teste statistice , 6(6), 88; doi:10.3390/math6060088, <https://www.mdpi.com/2227-7390/6/6> , p. 7.
- Bompa T.O., 2003, Totul despre pregătirea tinerilor campioni, Editura Ex Ponto, Bucuresti, pp.25-73.
- Castle D., & Richardson, A.B., 2001, Swimming even faster, *Biomechanics Symposia* 2001 /University of San Francisco, p.96-99.
- Ceseracciu E., Sawachs Z., Fantozzi S., Cortesi M., Gatta G., Corazza, S. et al., 2011, Markerless analysis of front crawl swimming. *Journal of biomechanics*, 44 (12), pp.2236-2242.
- Counsilman, J E , Counsilman, B.E., 1994, *The New Science of Swimming*, Prentice Hall, April 1994, ISBN 978-0-13-099888-0
- Guiman R., 2007, *Swimming drill book*, Ed. Human Kinetics, ISBN 10-07360-6251-3,p. 15.
- Israel S., Buhl, B., 1980, Posibilitățile de antrenament în perioada pubertății, *Körperziehung R.D.A. Nr.5/1980*, p.193-199.
- Maglischo E.W., 2003, *Swimming fastest*. Champaign, Human Kinetics, p.266,267.