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Effects Of Proposed Swimming Training Program For Enhancing Some Anaerobic Capacities Among 100-M Freestyle (9-12 Year Old) Junior Swimmers

تأثير برنامج تدريبي مقترح في رياضة السباحة في تحسين بعض القدرات اللاهو ائية لدى سبّاحي 100م حرة فئة الناشئين (12.09 سنة)

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Abstract : The study aimed to prepare a training program in the sport of swimming to improve some anaerobic abilities of the 100m free swimmers. The researcher relied this on the theories and references of "Magilcio", "Ossama Ratib" and "Abu Al-Ela Abdel Fattah". All of which indicate that the anaerobic threshold is of great importance in swimming training.This study was carried out to shed light on one of the four basic physical qualities or abilities (BPA) because of its importance in competitive swimming and its effect on improving the anaerobic capacity of the selected research group members in the baseline sample. From the research that has been undertaken on velocity-based training, it is possible to conclude that the proposed training program has a positive effect on developing the studied anaerobic capacity of 100-m freestyle trained swimmers and on increasing the responsiveness, interest-enjoyment and vitality of research sample.

Keywords: : training program, swimming, anaerobic capabilities.

الملخص : هدفت الدراسة إلى إعداد برنامج تدريبي في رياضة السباحة لتحسين بعض القدرات اللاهوائية لدى سباحي 100م حرة، وقد اعتمد الباحث في هذا على نظريات ومراجع كل من "ماجيلشيو" و"أسامة راتب" و"أبو العلا عبد الفتاح"، والتي تشير كلها إلى أن العتبة اللاهوائية من الأمور ذات الأهمية الكبيرة في تدريب السباحة. أجريت هذه الدراسة لإلقاء الضوء على إحدى الصفات أو القدرات البدنية الأساسية الأربعة (BPA) لأهميتها في السباحة التنافسية وتأثيرها في تحسين القدرة اللاهوائية لأعضاء مجموعة البحث المختارين في العينة الأساسية. من خلال البحث الذي تم إجراؤه على التدريب القائم على السرعة ، من الممكن أن نستنتج أن البرنامج التدريبي المقترح له تأثير إيجابي على تطوير القدرة اللاهوائية المدروسة لسباحين مدربين على السباحة الحرة لمسافة 100 متر وعلى زيادة الاستجابة والاستمتاع والاهتمام و حيوية عينة البحث.

-الكلمات المفتاحية : البرنامج التدريبي، السباحة، القدرات اللاهوائية.

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The theoretical framework

1- Introduction and problematic of the study:

The basic principles of swimming training and practicing higher levels depend on developing rhythmically the efficiency of nervous, muscular, respiratory and circulatory systems for the purpose of achieving the desired objectives. For a swimmer, this essentially means swimming a given distance in a fastest possible speed. The development of these systems depends on scientific sports training theory based on physiological knowledge (Saad, 2013, p. 282). The measurement of the maximum oxygen uptake (VO2max) is also very important parameter to directly assess the physical condition of a swimmer (Saad, 2013, p. 310). Studies have shown that a pool user body exhibits an expansion in bloodstream, which increases flow level and decreases blood pressure. It should be pointed out that in spite of the fact that the control of breathing is an automatic process, swimming workouts regulate breathing movement. It enables to neutralize, constraint, and control breathing pattern by correlating inhalation with arm strokes and calculating swimming distance (Al-Hashhoush, 2012, p.204). As part of this, Asaad Adnan et al. demonstrated that the proposed exercises in the method of non-tactical endurance have positively affected some physiological and biochemical variables in 200 m freestyle swimmers. They have had a role in causing faster physiological and chemical adaptations compared to other typical training exercises. In addition, there are other contributions related to the effectiveness of swimming in improving respiratory and circulatory systems, including that practicing swimming lowers generally body temperature, which leads to better treatment of some cases of insomnia resulting from an abnormal high body temperature (Al-Hashhouh, 2012, p.205). Costel and Maglischo confirmed that the swimmer's ability to use oxygen depends largely on the efficiency of both circulatory and respiratory systems, as there is a positive

relationship between the efficiency of the major body organs -to perform certain vital functions- and swimmers records (Zaki, 2002, p. 85). It is exactly for that reason that the need for more related research has prompted the need for employing swimming training units for enhancing some anaerobic capacities in swimmers on which it raises on top of all this set of questions:

General Question and Sub-Questions:

Does the proposed swimming training program have played an active role in improving some anaerobic capacities in swimmers?

Based on the above-mentioned, the sub-questions were:

1. Are there statistically significant differences for pre- and post-tests in vertical jump between research group in the baseline sample?
2. Are there statistically significant differences for pre- and post-tests in step test index between research group members in the baseline sample?
3. Are there statistically significant differences for pre- and post-tests in 100-m freestyle race between research group members in the baseline sample?

II. Research Hypotheses:

Main Hypothesis:

The proposed swimming training program have played an active role in improving some anaerobic capacities in swimmers.

Sub-hypotheses :

1. There are statistically significant differences for pre- and post-tests in Sargent Jump (Vertical Leap) between research group members in the baseline sample;
2. There are statistically significant differences for pre- and post-tests in step test index between research group members in the baseline sample; and
3. There are statistically significant differences for pre- and post-tests in 100-m freestyle race between research group members in the baseline sample.

III. Research Objectives :

- Recognizing the effect of the proposed training program for enhancing some anaerobic capacities in junior swimmers;
- Highlighting the set of major changes brought about by the proposed training program to junior swimmers; and
- Improving some anaerobic capacities and contributing to raising the level of performance.

IV- Research Terminology:

1- a. Training Program: one of the essential elements for an effective complete training planning process. The program is an implementing step in the nature of detailed activities that must be performed to successfully achieve the desired objectives (Albaik, 2003, p.102);

2- b. Swimming: an integrated sport activity that requires the use of one's entire body to move through water without having a walk at the bottom (Rateb, 2014, page 22); and

3- c. Anaerobic capacities: an ability that requires maximum physical effort to perform repeated muscle contractions by the adoption of anaerobic energy for a period ranges from 60 to 120 seconds (Hussain, 2014, page 32).

Previous Researches:

1- Kamal Hazhazi's (2015) study entitled: "Swimming's Role In Improving Some Physiological Functions In 10–12 Year Old Children: A Comparative Study With Two Samples Of Practitioners And Non-Practitioners". The study aimed at identifying the role of swimming in improving the physiological functions of body systems in 10–12 year old children. The descriptive research study was applied on a sample of 38 children registered for swimming lessons at a Semi Olympic-Size Pool in Ras El-Oued (Bordj Bou Arreridj; Algeria). The result obtained after applying the

SPSS program confirmed that swimming has a significant effect on improving the physiological functions in swimming practitioners compared to non-swimming practitioners;

2- Mazari Fatih's (2013) study entitled: "Realizing The Importance Of Adopting Feedback In Teaching Basic Swimming Skills". The research study aimed at understanding how to sensitize trainers towards the importance of feedback in improving learning basic swimming skills at Semi Olympic-Size Pool in Bouira (Algeria). The study was conducted by means of a questionnaire distributed to a sample consisted of 20 swimming coaches, where it can be concluded that, based on the facts, most coaches do not consider the feedback methods as an ideal way for training juniors, so the necessity of adopting feedback methods in training juniors and developing their skills was recommended by the researcher; and

3- Amara et al. (2013) study entitled: Evaluation And Assessment of First-Year Students (Common Trunk Class) In Freestyle Swimming At STAPS Institute –M'sila University-". The study population consisted of first year BA students. A random sample of 30 students was selected. After conducting a statistical evaluation and analyzing the results, it was concluded that teaching swimming has become an imperative, as it has a key role to play in improving mental, social and physical wellbeing and reducing the risk of contracting diseases.

Empirical side

1. **Research Methodology:**

A one-group pretest-posttest design was used in the current research.

2. **Research Sample and Its Specifications:**

The sample used in researches can be defined as a model that includes and reflects a representative unit part included in community-based research that it

carries its common characteristics. This part eliminates the need for studying all units and vocabulary, especially in the case of difficulty or impossibility of studying all units included in community-based research (Qandilji, 2012, p. 186).

3. Research Fields:

- Human field: The research was conducted on ten (10) trainees at Al-Wahda Swimming Club with Semi Olympic-Size Pool in Khémis Miliana (Algeria).
- Spatial domain: All tests were carried out at a Semi Olympic-Size Pool in Khémis Miliana (Algeria).
- Temporal domain: The research study was conducted during the period from October 24, 2017 to March 16, 2018.

4. Research Variables:

a. Independent variable: a proposed training program was implemented;
b. Dependent variable: some anaerobic capacities were examined as dependent variables; and
c. Extrinsic variable: referred to as disturbance variables because they are numerous and difficult to properly control, especially in the field of human sciences, given the fact that human behaviour varies from person to person and with time (Munawar, 2011, p.85).

5. Research Instruments:

- Personal interviews: were conducted with experts and specialists in the field of physical education/sport and exercise science in order to build a research study and its problems, as well as research mechanisms and methodology;
- **Questionnaire:**

A well-designed questionnaire was distributed for the purpose of assessing the validity of the proposed training program and the anaerobic capacities tests (Step Box Test, Sargent Vertical Jump Test), and determining the accuracy and objectivity of the test result. In this research, some available resources were

reviewed and best tests were chosen and presented in turn to a group of experts and specialists in the field of sports and exercise science as standardized and appropriate tests for the research sample.

- **Tests:**

A set of tests were applied to get the desired results:

a.Sargent Jump (Vertical Leap) Test:

Purpose: to identify the concept of anaerobic capacity and its relationship to the energy needed for building muscles and learn how to measure anaerobic capacity of vertical jump.

Equipments: a fixed /or moved wall mounted grid (100 cm in length), so that the starting point can be set at zero (0) point (or Wall-Mounted Vertec /or Jump Mat), a piece of chalk (for marking wall), a measuring tape and a medical weight scale. In the case of using a fixed wall mounted grid or marked wall, it is recommended to keep a minimum distance of 15 cm from the wall so that the athlete can perform freely vertical jumps.

Procedures: in order to conduct the test, some specific procedures are outlined as follows: (1) the athlete measures his/her weight; (2) the athlete warms up; (3) the athlete chalks (using sports chalk/magnesium carbonate powder) his/her fingertips; (4) the athlete stands side on to a wall and reaches up with the hand closest to the wall by keeping the feet flat on the ground; (5) the assistant marks the point of the fingertips on the fixed wall mounted grid or records on the vertical jump test map at its fair value (6) with a counter movement, the athlete bends his/her knees immediately prior to the jump in an attempt to reach the highest point and marks the wall with his/her chalked fingertips; (7) the assistant records the difference in distance between the standing reach height (M1) and the jump height (M2); and (8) the best of three attempts is recorded.

Measurement results: the determination of maximal anaerobic capacity during a vertical jump test can be assessed by entering jump height and body mass into a given equation. The equation is known as the Lewis formula (Fox & Mathews, 1974): P (kg • m2 • sec.-1) = √4.9 • body mass (kg) • √jump-reach score (m)

Table 01: shows the evaluation of Sargent Jump test results

Average / Gender	Excellent	Above average	Average	Below average	Poor
Male	**>65cm**	**56 - 65cm**	**51 - 55cm**	**46 -50 cm**	**<46cm**
Female	**>55cm**	**46 - 55 cm**	**41 - 45cm**	**36 - 40 cm**	**<36cm**

ALBAIK, Recent Trends in Sports Training: (Methods for Measuring Anaerobic and Aerobic Capacities, 2009, p. 95)

b. 60-second Step Box Test with 40-cm step box height

Purpose: to measure maximal anaerobic muscle power.

Equipments: a 40 cm high bench/ or step-up box, a digital stopwatch, a medical weight scale, and a handy calculator.

Procedure: the athlete steps on and off the box for 60 seconds. The athlete steps up with one foot and then the other. The athlete steps down with one foot followed by the other foot. The athlete steps on and off the bench/step-up box continuously (up, up <> down, down) for 60 seconds at a steady and consistent pace. The step counter does not count the step if the athlete bends his/ her free leg or pulls his/her torso forward.

Measurement: The step counter counts the athlete steps for 60 seconds. The measured workouts period represents the performance time in a given equation.

The equation is as follows:

P (kg • m2 • sec. -1) = √0.4m • body mass (kg) • √step-up score (60sec.) • 1.33.

The SI unit of power is expressed in the unit Joules per Second (J/s), which is equal to kg • m2 • sec. -1 (Le Système International d'Unités- BIPM)

c. 100m Swim Test:

Purpose: to measure an athlete's ability to swim 100 meters in the fastest time possible.

Equipment: standard 50-meter swimming pool, and a digital stopwatch.

Procedure: the athlete swims 100 meters (2 laps of an Olympic size swimming pool) in the fastest time possible. The athlete gets ready, starts the stopwatch and begins swimming in the water in an ideally space out of 15 seconds apart at one end, from a start of the 100m at his/her own pace. The athlete stops the stopwatch when the subject's hand touches the wall at the end of the 100m.

Measurement: The total fastest time possible to swim the 100-m meters distance is recorded.

6. Scientific Basis of Tests:

The construct validity and test-retest reliability were evaluated. A 1-week period from November 11 to 18, 2017 at 10:59 (GMT +8:00) was scheduled. A place (semi-Olympic size swimming pool in Khémis Miliana; Algeria) was chosen to run the tests. The same test-retest conditions were fixed. Excel 2010 Statistical Analysis toolpack was used to perform Student's t-distribution. The results indicate the following:

Table 02 shows reliability and validity values in sample survey

Measures / Tests	Sample Size	Degrees Of Freedom	Calculated R-value	Reliability Coefficient	Validity Coefficient
Sargent Jump Test	6	5	0.99	0.99	0.99
Step Box Test				0.99	0.99
100-m Swim Test				0.98	0.98
Level Of Significance(0.05)					

Table 2 gives the results of a survey of students that correspond to Sargent jump test, step box test and 100-m swim test. The average values of the reliability coefficient were 0.99; 0.99; 0.98 for Sargent jump test, step box test and 100-m swim test; respectively, which means that the scores of each instrument are

reliable and accurate. The interpretation of validity coefficient values 0.99; 0.99; 0.98 for Sargent jump test, step box test and 100-m swim test; respectively, were considered to be fair, which means that the instruments are valid.

Objectivity: Preparation of participants and ease of application emphasized the objectivity of instruments.

Statistical Methods for Data Processing: SPSS statistical software was used for data processing.

IX-Results and Discussions:

first Hypothesis Presentation, Analysis and Discussion:

This section is concerned with presenting the analysis and discussion of the results of pretest and posttest performance of students.

• Presentation and discussion of sargent lump (vertical leap) test results:

Table 3 below demonstrates participants' pretest and posttest scores on Sargent Jump.

Statistical Scales / Tests	N-Sample Size	Mean	Standard Deviation	Calculated t-value	Tabulated t-value	Degree Of Freedom	Statistical Significance	Effect Size
Pre-test	10	34.5	147.17	4.67	1.83	9	Significant	0.11
Post-test	10	52	159.56					
Level Of Significance(0.05)								

As follows from the table shown above, the arithmetic average and standard deviation results of the participants' pretest-posttest scores were 34.5, and 147.17; and 52, and 159.56; respectively. For a significance level of 0.05 and 9 degrees of freedom, the calculated t-value, tabulated t-value, and effect size are 4.67, 1.83, and 0.11; respectively. We can therefore notice that there are significant differences between the arithmetic averages at the level of

significance (p≤0.05) and statistical significance in favour of participants' post-test, as the following figure 1 reveals:

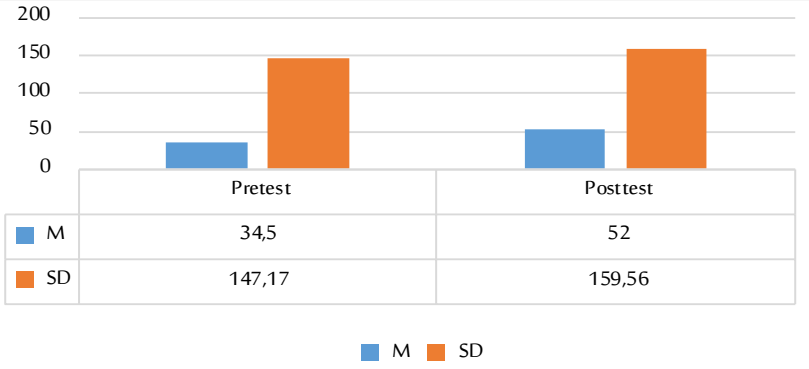

Figure 1: Arithmetic mean and standard deviation results of participants' pretest and posttest scores on Sargent Jump

As can be seen from Figure 1 above which demonstrates arithmetic average and standard deviation results of participants' pretest and posttest scores on Sargent Jump, the arithmetic mean results of the participants' posttest scores are good.

Discussion :

The first sub-hypothesis states that there are statistically significant differences for pre- and post-tests in Sargent Jump (Vertical Leap) between research group members in the baseline sample. It can be observed from a statistical point of view that there are differences between participants' pretest and posttest scores on Sargent Jump in favour of the posttest, where the calculated t-value was greater than the tabulated t-value. This result is in line with the study of Hazaa bin Muhammad Al-Hazaa (2008) who asserts that the anaerobic threshold is more likely to be improved by physical training than by the improvement achieved through maximum oxygen consumption (Al-Hazaa, 2008, p.4) Therefore, the results confirm the first sub-hypothesis.

Second Hypothesis Presentation, Analysis and Discussion:

• Presentation and discussion of step box test results:

Table 4 below provides details of participants' pretest and posttest scores on step

Statistical Scales / Tests	N-Sample Size	Mean	Standard Deviation	Calculated t-value	Tabulated t-value	Degree Of Freedom	Statistical Significance	Effect Size
Pre-test	10	288.9	1880.77	2.23	1.83	9	Significant	0.11
Post-test	10	304.9	2128.1					
Level Of Significance (0.05)								

As set forth in table 4 above, it is clear that the arithmetic average and standard deviation results of the participants' pretest-posttest scores were 288.9, and 1880.77; and 304.9, and 2128.1; respectively. For a significance level of 0.05 and 9 degrees of freedom, the calculated t-value, tabulated t-value, and effect size are 2.23, 1.83, and 0.11; respectively. We can therefore notice that there are significant differences between the arithmetic averages at the level of significance ($p \leq 0.05$) and statistical significance in favour of participants' post-test, as the following figure 2 summarizes:

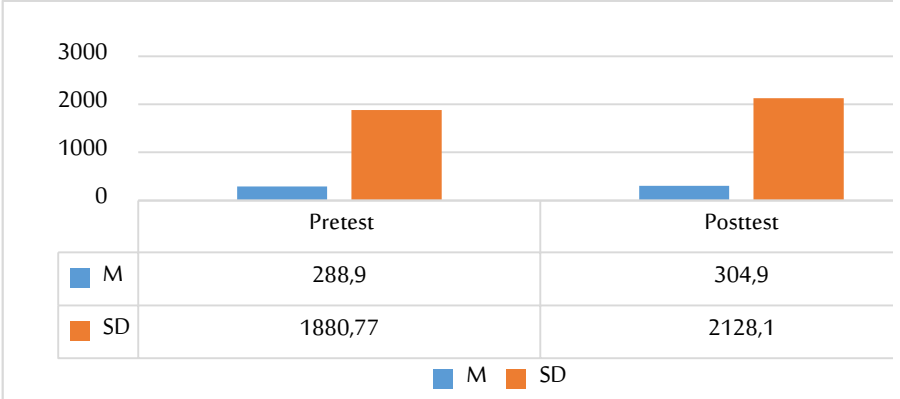

Figure 2: Arithmetic mean and standard deviation results of participants' pretest and posttest scores on Step Box

As it is also clear from Figure 2 above, which presents arithmetic average and standard deviation results of participants' pretest and posttest scores on Step Box, the arithmetic mean results of the participants' posttest scores are good

Discussion :

The second sub-hypothesis stipulates that are statistically significant differences for pre- and post-tests in step test index between research group members in the baseline sample. The result uncovers differences between participants' pretest and posttest scores on step box in favour of the posttest, where the calculated t-value was greater than the tabulated t-value. Apparently, these differences are attributed to the fact that the real commitment by participants to the training units and the training program assigned to them. This is, in a point of fact, consistent with Qassem Hassan Hussein's study related to competitive swimming. The author states that competitive swimmer should physiologically have high-rate anaerobic energy (Qassem, 2013, p. 133). The finding supports the outcomes related to a study carried out by Maglischo (2003) who state that swimming step test is an excellent estimate of swimmer's actual anaerobic threshold velocity (El-Qat, Sports Training Strategy in Swimming, Part Two, 2005, p. 303) This result is indeed seen to be in line with the present study that confirms that the post-tests results uncover a significant improvement in the participant's anaerobic capacity after the step box exercises. Thus, the result obtained confirms the second sub-hypothesis.

the third hypothesis Presentation, Analysis and Discussion:

- **Presentation and discussion of 100-m swim test results:**

Table 5 below provides details of participants' pretest and posttest scores on 100-m freestyle.

Statistical Scales / Tests	N-Sample Size	Mean	Standard Deviation	Calculated t-value	Tabulated t-value	Degree Of Freedom	Statistical Significance	Effect Size
Pre-test	10	1.32	0.0088	14.51	1.83	9	Significant	0.11
Post-test	10	1.03	0.0015					
Level Of Significance (0.05)								

From this table it can be seen that the arithmetic average and standard deviation results of the participants' pretest-posttest scores were 1.32, and 0.0088; and 1.035, and 0.0015; respectively. For a significance level of 0.05 and 9 degrees of freedom, the calculated t-value, tabulated t-value, and effect size are 14.51, 1.83, and 0.11; respectively. We can therefore notice that there are significant differences between the arithmetic averages at the level of significance ($p \leq 0.05$) and statistical significance in favour of participants' post-test, as the following figure 3 illustrates:

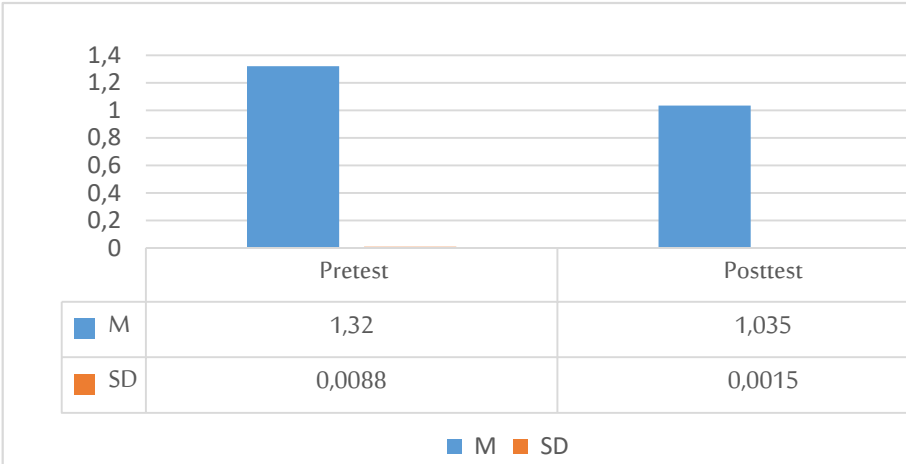

Figure 3: Arithmetic mean and standard deviation results of participants' pretest and posttest scores on 100-m freestyle

As follows from Figure 3, which shows arithmetic average and standard deviation results of participants' pretest and posttest scores on 100-m freestyle, it is obvious that the arithmetic mean results of the participants' posttest scores are good.

Discussion :

In addition to this, the third sub-hypothesis states that there are statistically significant differences for pre- and post-tests in 100-m freestyle race between research group members in the baseline sample. It has accordingly been necessary to highlight that the results reveal differences between participants' pretest and posttest scores on 100-m freestyle race in favour of the posttest, where the calculated t-value was greater than the tabulated t-value. This finding is confirmed by the fact that Bin Hadid Yusef's contribution related to the evaluation of some kinematic properties of competitive swimmers' strokes through suggested exercise program and its impact on athletes' digital record level. The author found that the proposed exercise in program has a positive impact on the digital record level of the experimental group. The author

attributes this statistically significant improvement with an impact factor of 0.11 to the effectiveness of the proposed training program that is based on anaerobic exercises and performance distances, which depend on the anaerobic system and aim to improve the digital competitive swimmers' velocity and record level. In this regard, Abu Al-Ela Abdel Fattah (2011) confirms in his work about modern trends in swimming workouts that the anaerobic energy is essential for the 100m freestyle and the velocity depends on the anaerobic exercise tests in training juniors. The author also emphasises that the velocity-based training must focus on the anaerobic energy systems (Al-Fattah, 2011, page 45). Asaad et al. also assert that the proposed exercises in the method of non-tactical endurance have positively affected some physiological and biochemical variables in 200 m freestyle swimmers. The authors confirm that the studied exercises have a role in causing faster physiological and chemical adaptations compared to other typical training exercises. The findings are, in a point of fact, consistent with Muhammad Ali Al-Qat's (2005) study related to swimming training strategies. The author confirms that competitive swimmer should physiologically have high-rate anaerobic energy to achieve high rate scores in individual medley races (El-Qat, 2005, p. 133) The results from these aforementioned studies are consistent with the results of this current paper, which highlights accordingly that the proposed training program has a positive effect on developing the anaerobic capacity of 100-m freestyle trained swimmers and thus, the first sub-hypothesis is valid.

Clearly, further research will be required to prove the anaerobic capacity and prove in turn the digital record levels of 100-m freestyle junior swimmers, apply the suggested training program in velocity-based training for 100-meter freestyle sprint swim workouts, as well as enhance the role of families and societies in encouraging children for enrolling in swimming lessons.

Discussion Of sub-hypotheses:

A more complete discussion of the sub-hypotheses and findings are included in a separate section below.

Findings:

Through statistical data processing, analysis and interpretation, the following conclusions were reached:

- The proposed training program has a positive effect on developing anaerobic capacity of 100-m freestyle trained swimmers.
- There are statistically significant differences between participants' pretest-posttest scores in favour of participants' post-test.

Conclusion:

This study was carried out to shed light on one of the four basic physical qualities or abilities (BPA) because of its importance in competitive swimming and its effect on improving the anaerobic capacity of the selected research group members in the baseline sample. From the research that has been undertaken on velocity-based training, it is possible to conclude that the proposed training program has a positive effect on developing the studied anaerobic capacity of 100-m freestyle trained swimmers and on increasing the responsiveness, interest-enjoyment and vitality of research sample.

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