Original article

Methodology for the training of figures in artistic swimmers, category 11-12 years

Metodología para el entrenamiento de las figuras en nadadoras artísticas categoría 11-12 años

Metodologia para o treinamento das figuras em nadadores artísticos, categoria 11-12 anos de idade

Liudmila Hernández Soutelo[1*] *, Alina Bestard Revilla*[1] *, Michel Corrales Delgado*[2] *,*

Elsa Sivila Jiménez[1] *, Rita María Pérez Ramírez*[1] *, Guillermina Virginia Zaldívar Cordón*[1]

[1]Universidad de Oriente. Santiago de Cuba. Cuba.

[2]Provincial Sports Directorate. Santiago de Cuba. Cuba

*Corresponding author: lhernandez@uo.edu.cu

ABSTRACT

The training of the figures in artistic swimming constitutes one of the fundamental aspects in the technical preparation of artistic swimmers, its mastery is a condition to achieve sporting success. However, currently the procedures and components that support it are insufficient. Hence, the research is aimed at verifying the behavior of the application of the methodology for the improvement of the training of figures in artistic swimmers. With a population of eight artistic swimmers in the 11-12 years category belonging to the "Capitán Orestes Acosta Herrera" School of Sports Initiation in Santiago de Cuba. The analytical-synthetic and systemic-structural-functional theoretical methods were applied; with respect to the empirical ones, the documentary analysis and the pre-experimental pretest-postest design for a single group and in the statistical ones the descriptive one with the mean, mode and standard deviation; and the inferential with the T Student test for related samples. In this sense, the proposal was characterized by the use of the systemic approach to the restructuring of the content from a training plan of the figures. The quality of the methodology was corroborated by the results obtained in the application of the pre-experiment confirmed by different statistical techniques that highlight its functionality, sustainability, relevance and feasibility.

Keywords: Figures, artistic swimming, training.

RESUMEN

El entrenamiento de las figuras en la natación artística constituye uno de los aspectos fundamentales en la preparación técnica de las nadadoras artísticas, su dominio es una condición para alcanzar el éxito deportivo. Sin embargo, en la actualidad son insuficientes los procedimientos y componentes que lo fundamentan. De ahí que la investigación está dirigida a comprobar el comportamiento de la aplicación de la metodología para el mejoramiento del entrenamiento de las figuras en las nadadoras artísticas. Con una población de ocho nadadoras artísticas de la categoría 11-12 años pertenecientes a la Escuela de Iniciación Deportiva Escolar "Capitán Orestes Acosta Herrera" de Santiago de Cuba. Se aplicó los métodos teóricos analítico-sintético y sistémico-estructural-funcional; con

respecto a los empíricos el análisis documental y el diseño pre-experimental pretest-postest para un solo grupo y en los estadísticos la descriptiva con la media, moda y desviación típica; y la inferencial con la prueba de T Student para muestras relacionadas. En tal sentido, la propuesta se caracterizó por el empleo del enfoque sistémico a la reestructuración del contenido a partir de un plan de entrenamiento de las figuras. La calidad de la metodología quedó corroborada por los resultados obtenidos en la aplicación del pre-experimento confirmado por diferentes técnicas estadísticas que resaltan su funcionabilidad, sostenibilidad, pertinencia y factibilidad.

Palabras clave: Figuras, natación artística, entrenamiento.

RESUMO

O treinamento de figuras no nado artístico é um dos aspectos fundamentais na preparação técnica dos nadadores artísticos, seu domínio é uma condição para alcançar o sucesso esportivo. No entanto, atualmente, os procedimentos e componentes nos quais ele se baseia são insuficientes. Por isso, a pesquisa tem como objetivo testar o comportamento da aplicação da metodologia para a melhoria do treinamento de figuras em nadadores artísticos. Com uma população de oito nadadores artísticos na categoria de 11-12 anos pertencentes à Escola de Iniciação Esportiva Escolar "Capitán Orestes Acosta Herrera", em Santiago de Cuba. Foram aplicados os métodos teóricos analítico-sintético e sistêmico-estrutural-funcional; com relação aos métodos empíricos, a análise documental e o desenho pré-experimental pré-teste-pós-teste para um único grupo e a estatística descritiva com a média, a moda e o desvio padrão; e a inferencial com o teste t de Student para amostras relacionadas. Nesse sentido, a proposta foi caracterizada pelo uso da abordagem sistêmica para a reestruturação do conteúdo com base em um plano de treinamento para as figuras. A qualidade da metodologia foi corroborada pelos resultados obtidos na aplicação do pré-experimento confirmados por diferentes técnicas estatísticas que destacam sua funcionalidade, sustentabilidade, relevância e viabilidade.

Palavras-chave: Figuras, nado artístico, treinamento.

INTRODUCTION

Sports training has become a complex pedagogical process, with very varied aspects with a specific form of organization, which makes it a systematic and global action.

In this regard, renowned authors of the theory and methodology of sports training such as Bompa and Buzzichelli (2016), Vinuesa and Vinuesa (2016), Capote *et al.* (2017, Camacho *et al.* (2019) and Rodriguez *et al.* (2022), consider that it is a pedagogical process and the fundamental way of preparing the athlete, based on systematic exercises.

In this sense, sports training is nothing more than a pedagogical process that prepares the athlete to achieve sporting results. In this process, indicators are established in its structure, where the coaches appear and depending on the sport, it is possible, due to their importance, to weigh their role.

Therefore, the training of technical elements is a fundamental task, where training loads are applied to these contents and methods, means and organizational procedures are used. According to the International Amateur Swimming Federation (2022), hereinafter FINA, in the artistic swimming the technical elements to train are: basic positions, figures and routines. The figures are the highest expression of the technical preparation of artistic swimming and although they are not a spectacle of the competitive activity, they are the technical base for the realization of the routines.

Figures are a combination of basic body positions and transitions performed in a manner and order established by the FINA description book of rules, unless otherwise specified in the description, the figures must be made tall and controlled, with uniform movement, with each section clearly defined (FINA, 2022).

The training of the figures in the category 11-12 years, even though it has a lower level of difficulty with respect to the older categories, its preparation is also complex. So, the athletes must execute in a high and controlled way, with uniform movement in each section, all the figures that are summoned for their competition. The training of this technical element has to be based on the design and control of each of the figures, FINA (2022).

However, at present the means for their training are still insufficient. Mastery of this didactic component is necessary for the elaboration and conduction of the training process of the figures in artistic swimming, which allows the coach to achieve a rational methodological organization.

Due to the importance of technique training in artistic swimming, various researches have been carried out. In this regard, different bibliographic sources related to the subject were consulted, including those carried out by FINA (2011), FINA (2017), Costa *et al.* (2019), Solana *et al.* (2019), Garcia *et al.* (2021), Podrihalo *et al.* (2021), Ponciano *et al.* (2021) and FINA (2022).

These authors have framed themselves in the sports initiation stage, specifically in the acquisition and development of basic skills and their technical characterization. A methodology for predicting success and personality traits for personalized education in artistic swimming is also carried out, but all these contributions are introduced in the execution of the routines.

In the case of the documents oriented by FINA to organize the artistic swimming competitions, a manual is included to evaluate the figures. Where only reference is made to the drawings of each figure and their degree of difficulty. It also includes in the evaluation of the figures a greater precision in the judgment, with a scoring scale based on ten points FINA (2017) and FINA (2022).

Other national authors such as Cortés *et al.* (2009), Martínez (2012), Cortés *et al.* (2005), Brito (2020) and Nápoles and Ruiz (2022) have delved into the basic positions as a starting point and basis for technical training, in the same way they have given greater relevance to the technical work of the routines. In all cases the contributions are significant. However, none of them shows a methodology that covers the training of figures.

In the Comprehensive Program for the Preparation of the Athlete, hereinafter (PIPD) governing document aimed at improving the teaching work based on the comprehensive training of artistic swimmers, there is still a lack of special exercises for the training of the

figures. Therefore, in the opinion of this author, the existing theories or theoretical references do not fully explain the problem under research.

Therefore, the objective of the present study is to verify the behavior of the application of the methodology for the improvement of the training of the figures in the artistic swimmers of the 11–12-year-old category.

MATERIALS AND METHODS

The study was carried out in the province of Santiago de Cuba and the "Capitán Orestes Acosta Herrera" School of Sports Initiation was selected as the setting. The research was developed in the sport of artistic swimming, category 11-12 years belonging to the stage of sports training. The type of study is explanatory and experimental design.

The population that was selected was eight artistic swimmers in the 11–12-year-old category, who made up the team to compete and went through the initiation and reserve stages. The population was characterized by having:

- Knowledge of the technique.

- Sports experience.

The following scientific methods and research techniques were used:

From the theoretical level, the analytical-synthetic method to delve into all the moments of the research process. And the systemic-structural-functional method aimed at modeling the methodology; where the structure and hierarchy of each component was determined, as well as its dynamics and operation.

Regarding the empirical level, the documentary analysis, which allowed the bibliographic review of the study of background related to the training of figures in artistic swimming, which enabled the author to assume the theoretical position of the research. In the review, scientific articles related to technical preparation in artistic swimming were consulted. The

analysis of the artistic swimming PIPD, the study of training plans (graphic and written) and training class plan for the category 11-12 years.

It was determined to apply the pre-experimental design with pretest-posttest for a single group, which is symbolized by $O_1 XO_2$. The measurement symbolized by O_1 was carried out in the seventh week of the preparatory period of the training plan using the traditional methodology. Then the next stage was intervened with the methodology for the improvement of the training of the figures, symbolized by X. At the end of this stage, the measurement symbolized by O_2 was carried out.

The application of the methodology for the training of the figures was carried out by two trainers of the 11-12 years category, with an execution time of 34 weeks. With the following organization by phases:

Phase 1: diagnosis.

Objective: to diagnose the indicators, from which the characterization of artistic swimmers must be carried out and the delimitation of their potentialities and insufficiencies.

Methodological steps applied:

- The conditions and trainers conducting the process were prepared.

- The instruments were elaborated (planning and application of the test of the eight figures: initial diagnosis pretest)

- Data were processed and diagnostic results interpreted.

- The proposal was shared with executives of the competitive art group, head of high performance and group of artistic swimming coaches, for their awareness of the objectives set.

- Methodological preparation with the group of artistic swimming coaches, for the socialization and exchange of knowledge that allowed the enrichment of the proposal and ways of implementation.

Phase 2: planning and execution of figure training

Objective: to improve the preparation of the figures from the improvement of the training in artistic swimmers, category 11-12 years.

Methodological steps applied:

- The results of the diagnosis were taken up again for the planning of the training of the figures.

- The coaches were advised in the planning and presentation of the training plan, in the act of discussion and approval of this graphic and written document.

- The implementation of the methodology was organized through the methodological preparations.

- Monthly meetings were held to analyze compliance with sports preparation, as well as to collect opinions on the implementation of the methodology.

Actions developed in this phase:

1. The duration of the macrocycle, distribution of periods and stages of training were determined.

2. The number of mesocycles and microcycles in the macrocycle.

3. The frequency of training and work time per session.

4. The dosage and distribution of the volume and intensity of the load throughout the macrocycle with attention to the technical directions and in particular to the figures.

5. The controls were located to evaluate the technical actions.

6. The exercises for the training of the figures were developed, taking into account their design and control.

7. Appropriate methods and procedures were selected for the improvement of the figures.

Phase 3: evaluation.

Objective: carry out a group of actions that allowed to verify if the methodology guaranteed the achievement of the proposed objectives.

Methodological steps applied:

- The indicators to be evaluated and the evaluation of the final diagnosis were specified

- The data obtained in the final test and information of the results to the artistic swimmers were processed.

- Adjustments were made in the technical preparation of the figures based on the results obtained in the test.

- Methodological activity was developed for the analysis of the application of the methodology in the training process, with artistic swimmers and coaches.

The experimental group had a sports experience of two to three years in the school category, with knowledge of the skills or techniques to compete. All were female, of the eight artistic swimmers, five were 11 years old and three were 12 years old. In the group there were deficiencies in the concentration when executing the technical actions. Regarding the infrastructure of the "Capitán Orestes Acosta Herrera" School of Sports Initiation, it met the material and human conditions for the application of the methodology.

There were two trainers in the experimental group (one graduated and the other a specialist in the sport), both of whom had 17 years of experience as artistic swimming trainers, with vast pedagogical expertise.

Control and evaluation of variables:

- Independent: methodology for training figures.

- Dependent: the execution of the figures in the artistic swimmers.

- Indicators to evaluate in the execution of the figures: ballet leg stretched (extended), barracuda, back walk, ballerina, kip, swordfish, swan and drop of water. With the rating scale from 0 (failed) to ten points (perfect), indicated by FINA (2017 - 2021) for its prosecution.

- The dependent variable was operationalized through indicators proposed by FINA (2017 - 2021) , used by the author and contextualized in this research.

- Extraneous variables: the selected pre-experimental design presented certain drawbacks that were not ignored in its planning. For this reason, some measures were taken:

- Regarding sports predisposition, a high level of content updating and motivation was maintained in the training units.

- As for the environmental conditions (training was avoided until the late hours of the morning).

In the processing of the results, descriptive statistical methods were applied, such as the mean, mode and standard deviation, which are central tendency and dispersion statistics. They described how values move toward or away from the mean.

As for the inferential statistics, the t test was used. Student's or matched-samples t test, which determined whether the group of artistic swimmers under study differed from a known value (a one- sample t-test). In the search for differences between the pre-test and the post-test in the same group evaluated on two occasions.

RESULTS AND DISCUSSION

Once the methodology was elaborated and applied, another empirical stage of the research was developed. This was constituted in a pre-pedagogical experiment that was designed to verify the validity of the methodology. The pre-experiment was carried out in two stages

for a single group: initial diagnosis (pretest) and final diagnosis (posttest) Hernandez and Mendoza (2018).

In the first stage, the initial diagnosis (pretest) was carried out, which yielded the results shown in graph 1. Below, the distribution of the data of the indicators evaluated in the dependent variable can be seen in the box plot:

1. Figure ballet leg stretched (extended).

2. Barracuda figure.

3. Back walk figure.

4. Ballerina figure.

5. kip figure

6. Swordfish figure.
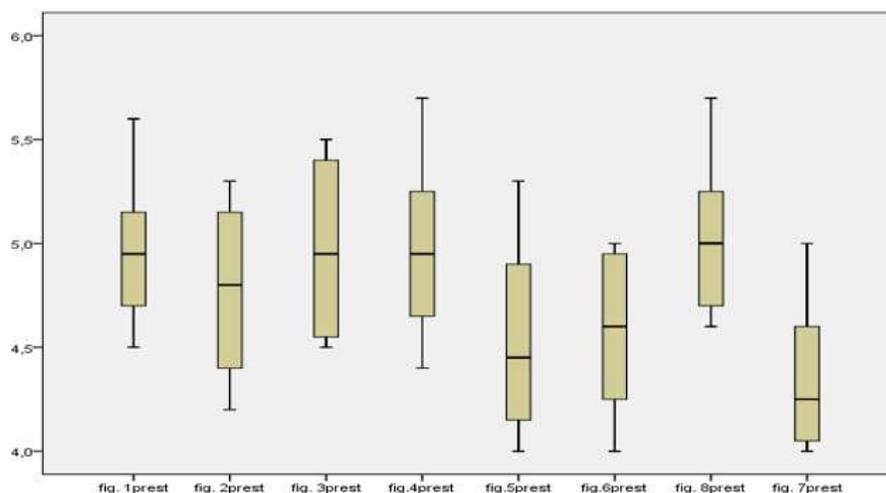
7. Swan figure.

8. Water drop figure.

Fig. 1. - *Results of descriptive statistics in the pretest evaluation*

In the pretest analysis, it can be seen in indicator 1 of Figure 1, that the average score was 4.9 where all the athletes obtained similar evaluations, which was regularly evaluated as a group. The low height and the passing of 90º of the ballet and the lack of control of this technical element were a trend. The evaluations were between a minimum of 4.5 and a maximum of 5.6, reported by athletes who were evaluated as good.

With respect to indicator 2, in the pretest, the average score was 4.7 where all the athletes obtained similar evaluations, so it was evaluated as fair in a group manner. Difficulties coexisted with the feet on the surface in the double submarine and low height in the lunge of the barracuda figure, the evaluations were between a minimum of 4.2 and a maximum of 5.3, reported athletes who were evaluated as good.

In the evaluation of indicator 3, the average score was 4.9 where all the athletes obtained similar evaluations, which was evaluated in a group manner as fair. Design changes were presented, little amplitude in the split and little buoyancy of the squad in the supine position, the evaluations were between a minimum of 4.5 and a maximum of 5.5, what showed there were athletes evaluated as very good.

In the evaluation of indicator 4, in the pretest, the average score was 4.9 where all the athletes obtained similar evaluations, so it was evaluated in a group manner as fair. There were difficulties in the design and stability of the ballerina figure, the evaluations were between a minimum of 4.4 and a maximum of 5.7, what showed there were athletes evaluated as very good.

Related to indicator 5, the average score was 4.5 where all the athletes obtained similar evaluations, which was evaluated in a group manner as fair, the lack of control and uniformity in the performance of the vertical was a trend, the evaluations were between a minimum of 4.0 and a maximum of 5.3, they gave an account of athletes who were evaluated as good.

In indicator 6, the average score was 4.5 where all the athletes obtained similar evaluations, so it was evaluated in a group way as fair. They presented difficulties in the design and little height in the execution of the swordfish figure, the evaluations were between a minimum of 4.0 and a maximum of 5.0, they gave an account of athletes who were evaluated as good.

The average score in indicator 7 was 4.5 where all the athletes obtained similar evaluations, which was evaluated in a group manner as fair. There was little control in the execution of the knight to the crane and when rotating 180º, the evaluations were between a minimum of 4.0 and a maximum of 5.0, they gave an account of athletes who were evaluated as good. Regarding indicator 8 of the pretest, the average score was 5.0 where all the athletes obtained similar evaluations, so it was evaluated as a group of good. Difficulties in the design of the drop of water figure were a tendency. The evaluations were between a minimum of 4.6 and a maximum of 5.7, they gave an account of athletes who were evaluated as good.

In the second stage of the pre-experiment, the final diagnosis (post-test) was made, which yielded the results shown in graph 2. Next, the distribution of the data of the eight indicators evaluated is observed in the box plot (Figure 2).
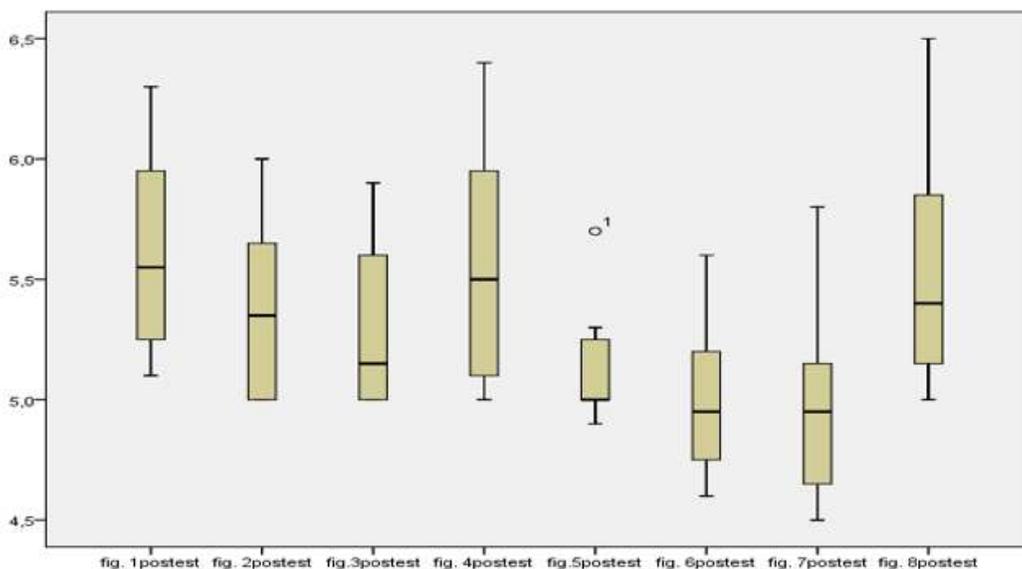

Fig. 2. - *Results of descriptive statistics in the post-test evaluation*

In the post-test analysis, it can be seen in indicator 1 of figure 2, that the average score was 5.6 where all the athletes obtained similar evaluations, which was evaluated as a group of good. The angle of the ballet, uniformity and control were improved, the evaluations were between a minimum of 5.1 and a maximum of 6.3, they gave an account of athletes who were evaluated as excellent.

Regarding indicator 2 in the post-test, the average score was 5.3 where all the athletes obtained similar evaluations, so it was evaluated as a group as good. The design and height in the lunge of the barracuda figure were improved, the evaluations were between a minimum of 5.0 and a maximum of 6.0, they gave an account of athletes who were evaluated as very good.

In the post-test evaluation of indicator 3, the average score was 5.3, where all the athletes obtained similar evaluations, which was evaluated as a group as good. Buoyancy, design and amplitude of movement were improved, the evaluations were between a minimum of 5.0 and a maximum of 5.9, they gave an account of athletes who were evaluated as good.

In the evaluation of indicator 4, in the post-test the average score was 5.5 where all the athletes obtained similar evaluations, so it was evaluated as a group as good. They showed better design and uniformity of the movement of the underwater flamingo to the surface, the evaluations were between a minimum of 5.0 and a maximum of 6.4, they gave an account of athletes who were evaluated as excellent.

Related to indicator 5 of the post-test, the average score was 5.1 where all the athletes obtained similar evaluations, which was evaluated as a group as good. The height in the vertical and stability of the kip figure were improved, the evaluations were between a minimum of 4.9 and a maximum of 5.7, they gave an account of athletes who were evaluated as very good.

In indicator 6 of the post-test, the average score was 5.0 where all the athletes obtained similar evaluations, so it was evaluated as a group as good. The design and control in the arched position improved, the evaluations were between a minimum of 4.6 and a maximum of 5.6, they gave an account of athletes who were evaluated as very good.

The average score in indicator 7 of the post-test was 4.9 where all the athletes obtained similar evaluations, which was evaluated as a group as good and the control and height of the swan technical element was improved, the evaluations were between a A minimum of 4.5 and a maximum of 5.8, they gave an account of athletes who were evaluated as very good.

Regarding indicator 8 of the post-test, the average score was 5.5 where all the athletes obtained similar evaluations, so it was evaluated as a group as good. The design of the corkscrew and control of the drop of water figure was improved, the evaluations were between a minimum of 5.0 and a maximum of 6.5, they gave an account of athletes who were evaluated as excellent.

In this sense, the relationship between the pretest and the posttest is evident. Where in table 1 and 2, the descriptive statistical data of the results of the artistic swimmers in the eight figures evaluated are presented. Which reflected higher scores in the technical element. In addition, the scale and range of ratings of the figures improved when the methodology was applied (Table 1) and (Table 2).

Table 1. - Results of the pretest in the analysis of the eight figures

Athletes	pretest F1	pretest F2	pretest F3	pretest F4	pretest F5	pretest F6	pretest F7	pretest F8	Half	AND	T Dev	CV	Min	max
Kamila C.	5.6	5.3	5.5	5.7	5.3	5	5	5.7	5.34	B.	0.29	5.34	5	5.7
Naomi	5.2	5.3	5.5	5.3	5	4.9	4.7	5.3	5.13	B.	0.26	5.11	4.7	5.5
Rosaa	5	4.9	5.1	5	4.5	4.7	4.3	5.1	4.79	R.	0.30	6.19	4.3	5.1
Yasira	5.1	5	5.3	5.2	4.8	5	4.5	5.2	4.99	R.	0.26	5.19	4.5	5.3
Jennifer	4.9	4.7	4.8	4.9	4.4	4.5	4.2	4.9	4.63	R.	0.27	5.77	4.2	4.9
Sunheri	4.8	4.5	4.6	4.7	4.2	4.3	4.1	4.7	4.46	R.	0.26	5.81	4.1	4.8
Salet	4.6	4.3	4.5	4.6	4.1	4.2	4	4.7	4.33	R.	0.26	6.02	4	4.7
Nicole	4.5	4.2	4.5	4.4	4	4	4	4.6	4.23	R.	0.25	6.03	4	4.6
Mean	5	4.8	5	5	4.5	4.6	4.4	5						
T Dev	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.4						
CV	0.07	0.09	0.09	0.08	0.1	0.08	0.08	0.07						
Min	4.5	4.2	4.5	4.4	4	4	4	4.6						

Max	5.6	5.3	5.5	5.7	5.3	5	5	5.7

Table 2. - Results of the post-test in the analysis of the eight figures

Athletes	post-test F1	post-test F2	posttest F3	posttest F4	posttest F5	posttest F6	posttest F7	posttest F8	Half	AND	T Dev	CV	Min	max
Kamila C.	6.3	6	5.9	6.4	5.7	5.6	5.8	6.5	6,025	B.	0.337	5,593	5.6	6.5
Naomi	6	5.7	5.7	6	5.3	5.3	5.2	6	5,650	B.	0.342	6,058	5.2	6
Rosa A	5.6	5.4	5.2	5.7	5	5	5.1	5.5	5,313	B.	0.275	5,173	5	5.7
Yasira	5.9	5.6	5.5	5.9	5.2	5.1	5	5.7	5,488	B.	0.352	6,420	5	5.9
Jennifer	5.5	5.3	5	5.3	5	4.9	4.9	5.3	5,150	B.	0.227	4,403	4.9	5.5
Sunheri	5.3	5	5	5.2	5	4.8	4.7	5.2	5,025	B.	0.205	4,085	4.7	5.3
Salet	5.2	5	5.1	5	5	4.7	4.6	5.1	4,963	R.	0.207	4,163	4.6	5.2
Nicole	5.1	5	5	5	4.9	4.6	4.5	5	4,888	R.	0.217	4,434	4.5	5.1
Mean	5.6	5.4	5.3	5.6	5.1	5	5	5.5						
T Dev	0.4	0.4	0.4	0.5	0.3	0.3	0.4	0.5						
CV	0.08	0.07	0.07	0.09	0.05	0.07	0.08	0.09						
Min	5.1	5	5	5	4.9	4.6	4.5	5						
Max	6.3	6	5.9	6.4	5.7	5.6	5.8	6.5						

In general, in the eight figures when applying the arithmetic mean, all the artistic swimmers improved the results from the pretest to the posttest, this revealed superior improvements in the design and control of the figures ballet leg stretched (extended), ballerina and drop of water, expressed in the standard deviation calculated in the pretest and posttest in the execution of the figures, which indicated little dispersion of the results around the mean.

The degree of variability of the results, reflected when applying the coefficient of variation, hereinafter (CV) a small variation or oscillation of the results. According to the Zatsiorski table (1989), when the CV is 0-10 percent, the oscillation is small, 11-20 percent medium, and greater than 20 percent, large.

To determine the significance of the results, the study of the data, which follow a normal distribution, was carried out. The Shapiro-Wilk normality test was used, where it was obtained that no case is below 0.05. So, the distribution of the variable analyzed is equal to the normal distribution.

The determination of normality allowed the selection of the t test. Student's or matched samples t test, which determines whether the group of athletes under study differs from a known value (a one-sample t test). In the search for differences between the pre-test and the post-test in the same group evaluated on two occasions, the following hypotheses were determined:

- · Null hypothesis (H $_{o)}$, the statement that there are no significant differences between the pretest and posttest (H $_{o:}$ μ $_1$ = μ $_2$ equal means)

- · Alternative hypothesis (H $_{A)}$, the statement that there are significant differences between the pre-test and the post-test (H $_{A:}$ μ $_1$ `''. μ $_2$ different means)

The significance level (α) was set at 0.025.

Table 3. - Indicators evaluated in the pretest and posttest

	pretest-posttest Figure 1	pretest - posttest figure 2	pretest - posttest figure 3	pretest - posttest figure 4	pretest - posttest figure 5	pretest - posttest figure 6	pretest - posttest figure 7	pretest - posttest figure 8
z	-17,197	12,961 ^{to}	-5.245 ^{to}	-12,253	-7,099	-7,202	-13,792	-9,336
Next asymptot. (bilateral)	,000	,000	,000	,000	,000	,000	.001	,000

It is concluded that, from the protocol for the application of the statistical test, it was determined that, when applying the T test for related samples, it is observed in the row Sig. asymptot. (bilateral) and its value of ,000 in all cases of the figures analyzed (Table 3).

It can be affirmed that, since the value of p (Sig. asymptot. (bilateral) is less than 0.025), then the null hypothesis is rejected and it is concluded that there is sufficient empirical evidence

to indicate that the proposal from a level of significance of 5 percent, with a reliability level of 95 percent, allowed determining significant changes once the methodology was applied.

The study carried out provides evidence in favor of the existence of a statistically significant relationship for alpha equal to 0.025 between the application of the methodology and the variable figures in artistic swimmers, category 11-12 years.

The applied methodology guaranteed a logical functional process for the training of the figures, in an organized and structured way, which allowed establishing a guide for the planning and application of the training. Elements that made up the methodology were assumed, proposed by De Armas and Valle (2011), Echemendia del Valle (2021), Cárdenas and Fabre (2022). As well as special exercises for the design and control of the figures. The results of the preliminary study showed an increase in the sports performance of artistic swimmers.

With this study, it was found that when there is an adequate training plan and with a group of special exercises depending on how the figures are evaluated, satisfactory results can be obtained as demonstrated by different authors FINA (2017) and FINA (2022).

Instead; Li *et al.* (2020), Podrihalo *et al.* (2021) and Ponciano *et al.* (2021) highlight the difficulty of technical actions in the arrangement and design of a set of movements. A success prediction methodology and personality traits for personalized instruction in artistic swimming are also included, but all these inputs are introduced in the execution of the routines.

Other authors such as Escrivá and González (2020) and Fons and Ruiz (2021) , propose a training system to develop explosive strength in the lower limbs, as well as the effect of strength on barracuda performance. These contributions are significant, but they do not include the contents for the training of the barracuda figure, which reveal the difficulty in the competitions.

However, Brito (2020) makes a compilation of research and work by coaches with extensive experience in sports and that serve as a methodological tool. But the contributions based on the training of the figures are still insufficient.

Consequently, with the different meanings assumed by the aforementioned researchers, it can be argued that the epistemological limitations detected in their methodologies reveal procedural omissions. This makes it difficult to train the figures towards the fulfillment of the planned objectives.

Hence, the relevance of the contribution of this research that showed in the analysis of the relationship between the pretest and the posttest applied to artistic swimmers, greater precision in the design of the figures, better control of the fluttering on the surface and in the water, greater uniformity in the technical execution and better buoyancy in the realization of the figures. An improvement in the sports performance of the artistic swimmers was verified.

The application of this methodology, with a larger number of artistic swimmers in different contexts, assumes that similar results can be obtained and that it provides a guide for the work of artistic swimming coaches.

The results obtained in the research process revealed the importance of the creation and application of the methodology for the training of the figures. What represents an essential methodological contribution in technical training and for the increase in sports performance of artistic swimmers, category 11-2 years.

THANKS

https://podium.upr.edu.cu/index.php/podium/article/view/1456

REFERENCES

Armas Ramírez, N. de, & Valle, A. (2011). *Resultados científicos en la investigación educativa*. Pueblo y Educación. https://books.google.com.cu/books/about/Resultados_cient%C3%ADficos_en_la_investigac.html?id=pSAmtAEACAAJ&redir_esc=y

Bompa, T. & Buzzichelli, C. (2016). *Periodización del entrenamiento deportivo*. Barcelona: Paidotribo. https://www.canariasbooks.com/libro/periodizacion-del-entrenamiento-deportivo_305290

Brito Vázquez, E. (2020). *La natación artística cubana*. Editorial Universitaria (Cuba). https://books.google.com.cu/books?id=YZb6DwAAQBAJ&printsec=frontcover&redir_esc=y#v=onepage&q&f=false

Camacho, J., Ochoa, N. y Rincón, N. (2019). Revisión teórica de la planificación tradicional y contemporánea en el entrenamiento deportivo. *Revista Digital: Actividad Física y Deporte. 5 (2).* https://revistas.udca.edu.co/index.php/rdafd/article/view/1265

Cancio Cento, S. M., & Cortés Cancio, K. (2005). Programa para la enseñanza del Nado Sincronizado, categoría 5 -6 años. *EFDeportes.com, Revista Digital, 10*(90). https://efdeportes.com/efd90/sincro.htm

Capote Lavandero, G., Rodríguez Torres, A., Analuiza Analuiza, E., Cáceres Sánchez, C., & Rendón Morales, P. (2017). El deporte, el entrenamiento deportivo y los entrenadores. *Revista Digital Buenos Aires, 22(234).* https://www.efdeportes.com/efd234/el-deporte-el-entrenamiento-deportivo-y-los-entrenadores.htm

Cárdenas Toledo, W. A., & Fabre Cavanna, J. E. (2022). Metodología para la enseñanza de la danza folclórica del ritmo Pasacalle/Methodology for teaching the folk dance of the Pasacalle rhythm. *PODIUM - Revista de Ciencia y Tecnología en la Cultura Física*, *17*(2). https://podium.upr.edu.cu/index.php/podium/article/view/1268

Cortés Cancio, K., Cancio Cento, S., & Hernández Sereno, R. (2009). Metodología para la enseñanza de las posiciones básicas del nado sincronizado. Su aplicación en atletas camagüeyanas. *EFDeportes.com, Revista Digital*, *14*(134). https://efdeportes.com/efd134/ensenanza-de-las-posiciones-basicas-del-nado-sincronizado.htm

Costa, P. B., Richmond, S. R., Smith, C. R., Currier, B., Stecker, R. A., Gieske, B. T., Kemp, K., Witherbee, K. E., & Kerksick, C. M. (2019). Physiologic, Metabolic, and Nutritional Attributes of Collegiate Synchronized Swimmers. *International Journal of Sports Physiology and Performance*, *14*(5), pp. 658-664. https://doi.org/10.1123/ijspp.2018-0547

Echemendia del Valle, A. (2021). Metodología para el entrenamiento de la marcha convencional en pacientes con lesiones medulares. Estudio preliminar. *PODIUM - Revista de Ciencia y Tecnología en la Cultura Física*, *16*(3). https://podium.upr.edu.cu/index.php/podium/article/view/991

Escrivá Selles, F. R., & González-Badillo, J. (2020). Efecto de dos periodos de entrenamiento de fuerza sobre el rendimiento en los ejercicios de salto vertical, tintorera y boost en natación sincronizada. *Apunts. Educacion Fisica y Deportes*, *142*, pp. 35-45. https://doi.org/10.5672/apunts.2014-0983.es.(2020/4).142.05

Fédération Internationale de Natation. (2021). *FINA artistic swimming manual for judges, coaches and referees 2017-2021*. FINA. https://resources.fina.org/fina/document/2021/02/03/4d9cd6d0-5146-44ae-bf94-4ac757eaf34b/fina_as_manual_-_updated_august_2018_0.pdf

Fons Cabrera, K., & Ruiz Sánchez, J. I. (2021). Sistema de preparación para desarrollar fuerza explosiva en miembros inferiores de atletas de natación artística. *Ciencia y Deporte*, *6*(3), pp. 32-45. https://dialnet.unirioja.es/servlet/articulo?codigo=8441621

García, I., Drobnic, F., Pons, V., & Viscor, G. (2021). Changes in Lung Diffusing Capacity of Elite Artistic Swimmers During Training. *International Journal of Sports Medicine*, *42*(3), pp. 227-233. https://doi.org/10.1055/a-1212-1020

Hernández Sampieri, R., & Mendoza Torres, C. P. (2018). *Metodología de la investigación. Las rutas cuantitativa, cualitativa y mixt*. McGraw-Hill Interamericana. https://books.google.com.cu/books/about/METODOLOG%C3%8DA_DE_LA_INVESTIGACI%C3%93N.html?id=5A2QDwAAQBAJ&redir_esc=y

Li, L., Xin, X., Wei, M., Hui, D., & Mei, P. (2020). Research on the Action Design of Team Artistic Swimming. *International Journal of Sports Science and Physical Education*, *5*(1), 5. https://doi.org/10.11648/j.ijsspe.20200501.12

Martínez Díaz, Y. (2012). Estrategia metodológica para el nivel inicial en el nado sincronizado, en las edades de 5 a 8 años. *EFDeportes.com, Revista Digital*, *17*(174). https://www.efdeportes.com/efd174/estrategia-metodologica-en-el-nado-sincronizado.htm

Meira, C., Ponciano, K., Tosini, L., Sousa, C., Barbosa, R., & Gomes, A. C. (2021). Personality traits and competitive preferences of artistic swimming athletes. *Academia Letters*. https://www.academia.edu/46857854/Personality_traits_and_competitive_preferences_of_artistic_swimming_athletes

Nápoles Céspedes, A. & Ruiz Sánchez, J. (2022). Alternativa metodológica para entrenar la posición de vertical en flotación en la natación artística. *Revista Ciencia y Deporte, 7(3)*: 100-111. https://doi.org/10.34982/2223.1773.2022.V7.No3.008

Podrihalo, O., Podrigalo, L. V., Jagie[33]o, W., Iermakov, S., & Yermakova, T. (2021). Substantiation of Methods for Predicting Success in Artistic Swimming. *International Journal of Environmental Research and Public Health*, *18*(16), pp. 87-39. https://doi.org/10.3390/ijerph18168739

Real Federación Española de Natación. (2011). *Manual de natación sincronizada 2009-2013*. FINA. https://www.foraqua.es/wp-content/uploads/2021/06/12.-MANUAL-de-NATACION-SINCRONIZADA-2009-2013.pdf

Real Federación Española de Natación. (2017). *Reglamento de Natación Artística 2017-2022*. FINA. https://resources.fina.org/fina/document/2021/01/08/e9bfaa2e-3bd5-4127-8ad2-29c51d71fdf4/ARTISTIC-SWIMMING-2017-2021.pdf

Real Federación Española de Natación. (2022). *Reglamento de natación artística*. FINA. https://resources.fina.org/fina/document/2022/11/01/4b3598b6-18cd-411e-ac09-16e49965df3a/00-AS-Rules-2022-2025-Confirmed.pdf

Rodríguez Verdura, H., León Vázquez, L., & de la Paz Ávila, J. (2022). La enseñanza deportiva y el entrenamiento deportivo/Sports education and sports training. PODIUM Revista de Ciencia y Tecnología en la Cultura Física, 17(2), pp. 842-857.https://podium.upr.edu.cu/index.php/podium/article/view/1028

Solana-Tramunt, M., Arboix-Alió, J., Aguilera-Castells, J., Morales, J., Buscà, B., & Nieto Guisado, A. (2019). Is Heart Rate Variablity a Suitable method For Monitoring The Effect Of A Training Session In Synchronized Swimming? *Medicine & Science in Sports & Exercise*, *49*(5), S21. https://doi.org/10.1249/01.mss.0000560575.86649.75

Vinuesa Lope, M., & Vinuesa Jiménez, I. (2016). Conceptos y métodos para el entrenamiento físico. Ministerio de Defensa. https://publicaciones.defensa.gob.es/media/downloadable/files/links/c/o/conceptos-y-m_todos-para-el-entrenamiento-f_sico.pdf

Zatsiorsky, V. M. (1989). *Metrología deportiva: Libro de texto*. Planeta. https://books.google.com.cu/books/about/Metrolog%C3%ADa_deportiva.html?id=P45WPQAACAAJ&redir_esc=y

Conflict of interests:

The authors declare not to have any interest conflicts.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents