

Translated from the original in Spanish

Original article

## Diagnosis to perfect the special strength in water of Pinar del Río water polo players

### Diagnóstico para perfeccionar la fuerza especial en el agua de los jugadores de polo acuático de Pinar del Río

### Diagnóstico para aperfeiçoar a força especial na água em polistas de Pinar del Río

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**Received:** January 27<sup>th</sup>, 2020.

**Approved:** March 23<sup>th</sup>, 2020.

## ABSTRACT

The present work had the objective of characterizing the current situation of the Man water polo school team athletes of the EIDE (School of Sport base formation) of Pinar del Río, in relation to the special strength in water, in order to give an answer to one of the technological demands that affects the performance in this sport. By means of empirical methods such as observation, it was found that the athletes, after the second half of the game, could not keep the same performance as in the first two, and a great physical wear was noticed in them, which responds to the lack of special strength in water to support the endurance to the aquatic environment and the struggle with the opponent. Surveys were applied to the coaches, which reflected that there are deficiencies in the planning of the training sessions, affecting the optimal preparation of the special strength in water. The review of the Integral Program of Preparation of the athlete (2016) was carried out, not finding specific methodological actions for the work of the special strength in water as a guide for the work of the trainers in the process of training of this capacity, other documents that are used by the trainers were also reviewed. Measurements were made to determine the level of special strength in water of these school athletes. The use of theoretical methods such as historical-logical, inductive-deductive, analysis-synthesis, and statistical-mathematical methods, specifically descriptive statistics, were also part of this study.

**Keywords:** physical preparation; special strength in the water pole; diagnosis.



## RESUMEN

El presente trabajo tuvo como objetivo caracterizar la situación actual de los atletas del equipo escolar masculino de polo acuático de la EIDE (Escuela de Iniciación Deportiva) de Pinar del Río, en relación con la fuerza especial en agua, para dar respuesta a una de las demandas tecnológicas que incide en el rendimiento de este deporte. Mediante los métodos empíricos como la observación, se constató que los atletas después de pasar del segundo tiempo de juego, no podían mantener el mismo rendimiento que en los dos primeros, notándose un gran desgaste físico en ellos, lo cual responde a la falta de fuerza especial en agua para soportar la resistencia al medio acuático y al forcejeo con el contrario. Se les aplicó encuestas a los entrenadores, las cuales reflejaron existen insuficiencias en la planificación de los entrenamientos, lo que incide en la preparación óptima de la fuerza especial en agua. Se realizó la revisión al Programa Integral de Preparación del Deportista del año 2016 y no se encontraron acciones metodológicas específicas para el trabajo de la fuerza especial en agua como guía para el trabajo de los entrenadores en el proceso de entrenamiento de esta capacidad. Se revisaron otros documentos que son utilizados por los entrenadores. Se realizaron mediciones para determinar el nivel de fuerza especial en agua de estos atletas escolares. Formó parte de este estudio el uso de los métodos teóricos como el histórico-lógico, inductivo-deductivo, análisis-síntesis y los estadísticos-matemáticos, específicamente la estadística descriptiva.

**Palabras clave:** preparación física; fuerza especial en el polo acuático; diagnóstico.

## RESUMO

O presente trabalho teve o objetivo de caracterizar a situação atual dos atletas da equipe escolar masculino de polo aquático da EIDE (Escola de Iniciação Desportiva) de Pinar del Río, em relação à força especial na água, a fim de responder a uma das exigências tecnológicas que afetam o desempenho deste esporte. Através de métodos empíricos como a observação, verificou-se que os atletas, após a segunda metade do jogo, não conseguiam manter o mesmo desempenho que nas duas primeiras, sendo notado um grande desgaste físico neles, o que responde à falta de força especial na água para suportar a resistência ao meio aquático e a contenda com o adversário. Foram aplicadas pesquisas aos treinadores, que mostraram que havia falhas no planejamento das sessões de treinamento, o que afeta a preparação ótima da força especial na água. Foi realizada a revisão do Programa de Preparação Integral do Desportista 2016 e não foram detectadas ações metodológicas específicas para o trabalho da força especial na água como guia para o trabalho dos treinadores no processo de formação desta capacidade. Outros documentos que são utilizados pelos treinadores também foram revistos. Foram feitas medições para determinar o nível de força especial na água destes atletas escolares. O uso de métodos teóricos como histórico-lógico, indutivo-dedutivo, análise-síntese e estatístico-matemático, especificamente a estatística descritiva, também fez parte deste estudo.

**Palavras-chave:** preparação física; força especial no polo aquático; diagnóstico.

## INTRODUCTION

One of the sports that most demands a good physical and mental condition is water polo, as well as a great coordination, especially considering the limitations of the water environment.



Water polo, as an overall sport, requires, in its preparation and training process of high achievements, tactical team actions. Nowadays, it is no longer associated with a retrograde concept, seen from the prism of swimming as a sport with individual cyclical and sequential characteristics intrinsic to the race swimming modality.

Given the specificity of the sports required by the high level of contemporary performance, the vision is more related to the performance of the game in the aquatic environment and its own identity of an acyclical nature, characterized in sports as a whole, with an internal logic of the game, influenced by cooperation-opposition.

In current training, the varicapacity of actions in water polo requires a scientific approach to physical preparation, based on the theoretical-methodological concepts provided by the sciences applied to the sport. For this reason, to achieve a good special physical preparation in water, it is necessary that the trainer selects exercises that stimulate the biological adaptation of the sportsman to obtain high competitive results.

The physical preparation of the polo player is fundamental, according to Vila Blanch, M. (2014),

"Water polo is a contact and collective sport. In the course of a match, many actions of different duration and intensity occur such as jumping, throwing, fighting, swimming, which involve a great deal of physical movement during the game. Each player must swim constantly while passing the ball, defending against the actions of the opponents and scoring points. Water polo players may need to perform a freestyle swim, backstroke, or maneuver to stay in place.

Within the physical preparation that the polo player carries out, specifically the work of the conditional capacities, are considered as the most important: the endurance to strength and speed. This does not mean that the others are not important, since all of them become evident given the varicapacity of situations in this sport, which demands an integral development of the athlete.

In the last two years, there has been a drop in the results of the Pinar del Río water polo teams. This can be seen in the results of the National School Games, the Youth Games and the first category National Lleague of 2018 and 2019, where it was observed that the athletes, in both sexes, after the second half of the game, could not maintain the same performance as in the first two times. However, coaches recognize the shortcomings in the process of conducting training for the work of the special strength in water.

According to Hollfmann, quoted in Borges, C.A. (2010),

"training is the set of actions, which cause adaptations in the organism to improve a certain motor skill, defines sports training as the sum of stimuli in a certain period of time, carried out with the aim of increasing performance and which lead to functional and morphological modifications or adaptations of the organism".

It is widely considered to be the basis of training that governs the physical preparation of collective sports. It could be said that training has traditionally focused on the improvement of physical qualities in isolation, so that planning was organized



around the qualities and not the characteristics of the team (players, history, form of play).

Based on the background of various studies, including Vila Blanch, M. (2016), he suggests that,

"The components of general and specific preparation change according to the state of training that is created, in the sense of increasing specialization. The absolute elite athlete still has general training exercises in his repertoire; however, the contents of the specific training clearly predominate".

We agree with Machado Almanza, J. P. (2018), that all the capacities are of great importance, but that really everything depends on the sport in question; in the case of the water polo, the fundamental capacities are considered to be strength, firstly, endurance and speed, and from there the combination of all of them, say endurance to speed, endurance to strength, speed of reaction, out explosive to name a few.

According to Roman I. (2011),

"The physical preparation is divided into general and special, according to the periodization of the training process; the fundamental tasks are the increase of the physical work capacity and the development of the conditional and coordinative ones. Within the conditional capacities, we find, par excellence, the strength that occupies one of the fundamental places in sports training".

Considering the intermittent character of the water polo, it is necessary to plan the training where both systems are worked: aerobic and anaerobic, with a distribution similar to the competition percentages.

In several methods of physical preparation studied, it has been demonstrated that the most effective is to combine dry strength work with specific strength work in the water Gregori Rodriguez, J.M. (2017).

Although the game of WP itself can improve many of these factors, professional WP players should perform an additional specific conditioning program, including exercises to develop high-intensity, high-velocity, high-direction, strength, and power intermittent anaerobic stress.

Each of these factors can be improved with proper training, in particular, with exercise programs with train endurance below throwing capacity, emphasizing that coaches should include strength and power programs not only for the shoulders and arms, but also for the lower limbs.

Two training sessions per week seem sufficient to induce a substantial improvement not only in maximum power production and dynamic strength, but also in throwing speed, Ramos Veliz, R. (2015).

The approach is that if arm and leg training is not combined in the polo player, the physical development of the polo player will not be ideal.



Becali, A. (2011) states that,

"Strength training is a core aspect of any sport. Strength is indispensable to achieve every objective and every goal proposed".

Strength, according to Román, I. (2011),

"is a conditional capacity that is within the physical preparation and is an important part of the athlete's preparation."

He defines it in the field of sport as the capacity to overcome endurance or counteract it through muscular action. Furthermore, it defines useful strength, in the sports environment, as that which we can apply or manifest at the speed at which the sports gesture is made. An athlete does not have a single level of maximum strength, but many different ones, depending on the speed at which the maximum strength is measured. The strength that one is not able to apply can be said to be really not.

Since the 90's, the concept of strength training in water polo has progressively acquired importance along with the appearance of research and technologies for its knowledge and study; we deduce that it is the most important conditional quality to be dealt with in this sport (along with speed and without eluding the work integrated with the rest of the qualities) Gregori Rodríguez, J.M. (2017).

According to Terry Schroeder, coach of the American water polo team, "everything is based on the legs". If you want to be good at water polo, you need strong legs, but if you want to be a great player, you have to have really strong legs.

Strong legs also help improve your chances of getting a good offensive shot and getting back quickly to defend against counterattacks.

In the scientific literature, many studies have been interested in determining if there is a correlation between general strength exercises and sport-specific actions.

In the field of water polo, the evaluation of muscle strength and power and its relationship to game performance has been very little researched. Rodríguez Sainz, N. (2018), has evaluated isometric grip strength, arm extension and rotation strength using a tensiometry cable.

They found no changes in the throwing speed, but increases in the strength levels.

In the study conducted by Ferrer M.A. (2012), a correlation between isometric grip strength and goalie throwing speed was found, but not in other throwing situations.

Vila Blanch, M (2016) found a moderate correlation between the maximum dynamic pull-over strength and trunk rotation to the left, with the throwing speed. In relation to the lower extremities, it is verified that there is no correlation between the vertical jump in dry and in water. These results are attributed to the technical peculiarities of the movement, required in the water. On the other hand, it finds a moderate correlation between the lower limbs and the throwing speed.

Also of great interest has been the response produced by different training methods on the levels of muscle strength and power, thus inducing the improvement of sport-specific performance (Vila Blanch, M. (2014).



In recent years, strength training has taken on an essential role in training planning as it has a positive influence on the improvement of other qualities and therefore on the athlete's performance.

Recent studies [Ramos Veliz, R. \(2015\)](#), show that with proper strength training, there is a greater response to the physiological demands that all physical activity requires. Therefore, we deduce that strength is beneficial and should be trained, following an adequate progression from the first stages of training, providing the appropriate stimulus to create beneficial adaptations for the practitioners in question, the water polo players.

We agree with [Vila Blanch, M. \(2014\)](#) that the work of the strength of the legs is fundamental since it is the support of the body in the water; the polo player must have strong and fast legs, either to execute the bicycle leg, the sidestroke kick and the scissors kick; all the movements that are made in the water in the different directions are made with the legs, besides the jumps to intercept a ball, the shot on goal, where the body must be kept out of the water for some seconds, in the defense specifically.

## **MATERIALS AND METHODS**

The population used for the research was 6 coaches and 10 athletes, intentionally. The methods selected to fulfill the objective proposed in the research are the following:

Historical-logical: it was used to establish the background, the evolution of the object to be investigated, the analysis of historicity and its internal logic, which includes publications edited in Cuba and abroad on the main stages of its development, which expresses in a theoretical way its essence, the scientific criteria related to physical preparation and special strength in the water polo.

Inductive-deductive: it contributed to the determination of the problem and the differentiation of the tasks developed in the research process. Based on this, it was possible to proceed with the creation of the methodology. It also provided the establishment of the relations between the facts analyzed and the conclusions of the research.

Analysis-synthesis: to select the most reliable and updated information about the object of study of the research and to process the referential theoretical framework, from the systematization of scientific knowledge. It facilitated the recognition of the multiple relationships and components of the problem approached separately, to later integrate them into a whole, through which the interpretation of the information, collected through the application of the methods and instruments to arrive at the corresponding conclusions, was carried out.

Analysis of documents: different documents were consulted that allowed for a deeper understanding of the special strength in water and the current situation of the forms used by coaches to develop it, as well as the characteristics of this game as a collective sport, which represented an important factor in the theoretical foundation of the research.

- Sportsman's Integral Preparation Program (2016-2020).
- Master's and doctoral thesis dealing with the subject in question.





- Publications of similar studies in the water sector.

The analysis of the Integral Program of Preparation of the Sportsman (PPID) of Water Polo (2016-2020) was carried out to verify the existence of indications on the work of the special strength in water, which allows the trainers to have a methodological guide to work it. It was also used to specify the objectives and contents of the program for these ages.

It also allowed a detailed search on the reference topics in the different available sources, which are detailed in the bibliography, in order to verify the problem.

### **Empirical methods**

Survey: it was applied to a group of water polo coaches, with the aim of knowing the opinion and degree of knowledge they have about the work and importance of special strength in water, where they were asked seven questions. The survey evaluates in questions 1; 2; 4; 5; 6; 7 the level of knowledge of the coaches in the work of special strength in water and the level of preparation of the athletes in special strength in water, in question three.

Observation: 20 training matches and eight competition matches were observed, carried out during the last two editions of the male school category qualifying zones. During the evaluated stages, it was possible to detect the level of special strength that the athletes of that category possess.

Measurement: a pre-test was carried out to verify the level of special strength reached in water, in the water polo athletes, school category of the EIDE "Ormani Arenado LLonch". The test was held in April 2018 during the zonal qualifying competition, in the school category, for the 10 athletes who participated in it.

Specialist criteria: it was used to obtain conclusive assessments of a problem and make recommendations regarding its fundamental moments, with a maximum of competition. The specialists provided the necessary information on the specific contents of the sport and the possibilities of shaping a new concept of special strength in water.

## **RESULTS AND DISCUSSION**

After determining the relevant methods in the research, the following results are described:

For document analysis, the aspects listed in the guide were considered. (Comprehensive Athlete Preparation Program) for the four-year period 2016-2020.

When referring to the special strength in water, only general aspects are treated, there are no methodological orientations that allow the development of the special strength in water nor a conception of planning of the training, only some isolated exercises are mentioned that are not conceived without a dosage nor methods to work them; its approach only stays in the conceptual framework of the existence of the physical capacity, with great specificity in the technical order.



## Results of the survey

The following table shows the results of the survey applied to the water polo coaches of the EIDE of Pinar del Río, with an average work experience as a coach, in this sport of 19 years (Table 1).

**Table 1** - Results of the survey to coaches

Question	Item	Absolute frequency	Relative frequency (%)
<b>1</b>	A	3	50%
	B	2	33%
	C	5	83%
<b>2</b>	A	0	0%
	B	2	33%
	C	4	66%
<b>3</b>	A	1V 5F	16%F 83%V
	B	6F	100%
	C	6V	100%
<b>4</b>	A	6(si)	100%
	B	5(yes) 1(no)	83%(yes) 16%(no)
	C	2(yes) 4(no)	33%yes) 66%(no)
<b>5</b>	A	0	0%
	B	5	83%
	C	1	16%
	D	0	0%
<b>6</b>	A	0	0%
	B	6	100%
	C	0	0%
	D	0	0%
	E	0	0%
<b>7</b>	A(yes)	5	83%
	B(no)	1	16%

In the analysis of the first question, it was found that there is a divergence in the approaches of the trainers, so there is insecurity, lack of knowledge regarding the special strength in water. On the other hand, there is coincidence in the second question referring to the development of the special strength in water in our province, the result is negative since no trainer indicated that it was good.

In the third question that talks about the preparation of the water polo athletes in the school category, it was found that there are really deficiencies in their preparation and that they are not adequately prepared for the fundamental competitions.

In the fourth question, it was found that there is a need for further exercises as it was the opinion of 83 % of the coaches, that there is a lack of the water polo PIPD on special strength in water. Good mastery by the coaches of the work stages and the preparation component they refer to was reflected in questions five and six.

In the last question, there is agreement on the importance of special strength in water, in obtaining sports results.

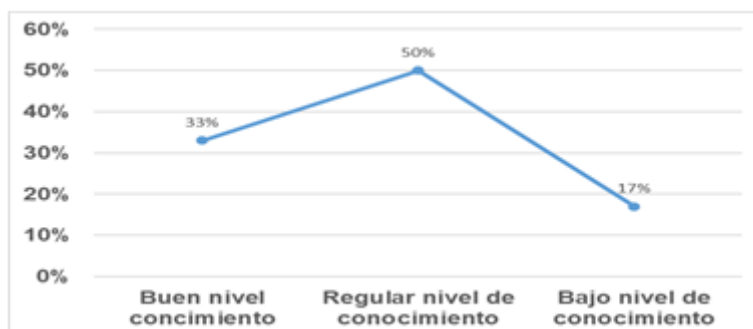




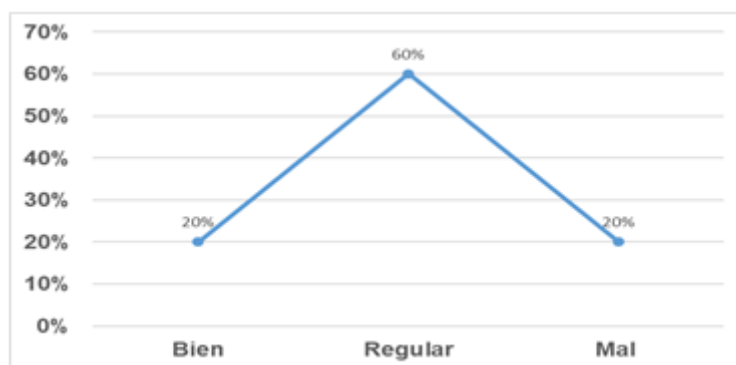
## Results of the observation

In the observation made to the trainings and competitive games, it was possible to detect that the level of knowledge about the special strength in water, 50 % of the trainers is regular what influences in the development of this capacity and, in general, 67 % of the trainers are not prepared to direct the work of this capacity due, to a great extent, to the poor dosage of the trainings, the empirical work and the lack of update of the exercises of trainings in the preparation of the athletes.

The poor mastery of the fundamentals, the principles of sports training and the methodological parameters for the work of the special strength in water is corroborated by the above (Figure 1).



**Fig. 1** - Observation of the level of application of the trainers' knowledge for the development of special strength in water



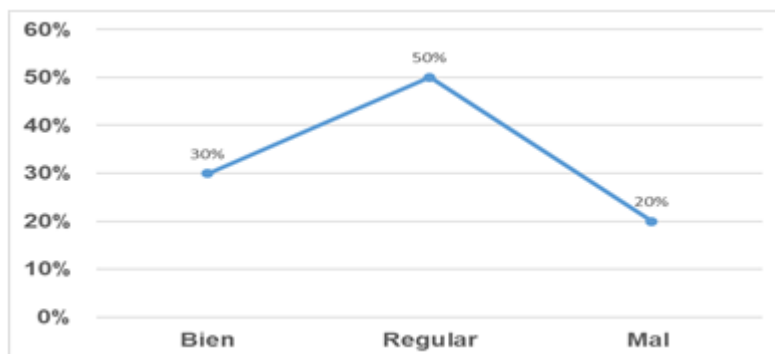
**Fig. 2** - Observation of special arm strength in athletes

It is observed that 60 % of the athletes have a regular level of special strength in water since there are deficiencies in the shots to goal in terms of power, in the struggle with the opponent in the different positions of the game to maintain the position in the water either vertical or horizontal (Figure 2).

The 20 % of the athletes observed present a bad evaluation since they present deficiencies in the displacements and in the push in the dribble, which is a product of a deficient special strength in water, as well as in other elements of the special strength of arms like the shot and the use of the arms in the struggle.



In general, it has been found that 80 % of athletes have deficiencies in the work of special strength in water (Figure 3).



**Fig. 3** - Observation of special leg strength in athletes

Of the ten athletes observed, 50 % have regular special leg strength, regular quality in the execution of jumps to intercept balls is noticed, and the intersection is not achieved due to the low leg strength, which in turn affects the shot on goal.

In 20 % of the athletes, a bad condition of the special strength of leg is reflected since the special elements are not executed in a suitable way as the jumps to intercept the balls and for the shot to goal; the displacements of legs are not effective because they do not present the required intensity. In this sense, there is a deficient special leg strength in terms of maintaining the position in the water, in the work of the post and the defense, as well as in the struggle (Table 2).

**Table 2.** - Measurement results

Number of shots with plumb bob (10 shots)	50 meters free with pallet	Vertical jump in 30" with plumb bob
Mean= 6.90 shots	Mean=44,7"	Mean=9,50 jumps
S=1,44	S=3,5	S=1,7
-70 % (7 athletes)	50 % below mean	50 % below mean

Three tests were carried out with the aim of evaluating the special strength in water of the arms and legs. The contents were 50 meters free with a paddle, jump with a plumb bob in 30 seconds and the number of shots with a plumb bob in ten shots.

In the analysis of the ten plumb bobs, no athlete achieved the maximum amount of executions. It is observed that seven athletes are at 70 % effectiveness, which based on the statistical analysis of the national water polo commission and the regularity of the significance of the percentages in the results of the teams with respect to the victories and losses, are regular in their interpretation.



The results of the 50 meter paddle test showed that 50 % of the athletes, that is, half of the team, did not achieve the average time of the test performed, that is, the difference between the best and the worst time in this test is significant.

In the vertical jump test in 30" with plumb bob, 50 % of the athletes made a number of jumps below the mean. In a synthesized way, it is stated that the theoretical study on the trends that support the training of physical preparation in water (special strength) shows that the treatment, which is given to this physical capacity, does not allow an improvement in the school athletes of water polo of the EIDE of Pinar del Río.

The applied research methods showed that water polo trainers have a low level of knowledge to develop special strength in water during training, which reflects in the athletes a deficient preparation that affects their sports performance.

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**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.



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