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Acciones para el tratamiento de la resistencia aeróbica en estudiantes de la carrera Ingeniería Química

Actions for the treatment of aerobic resistance in students of the Chemical Engineering carrier

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Resumen

El problema de las capacidades condicionales y su desarrollo en el hombre como ser biopsicosocial, ha sido motivo de preocupación y estudio por investigadores de diferentes países. Dentro de las capacidades condicionales se encuentra la resistencia aeróbica que tiene vital importancia en la preparación física del estudiante universitario. El objetivo de la investigación que se presenta es proponer acciones destinadas a la mejora de la resistencia aeróbica en los estudiantes de la carrera Ingeniería Química, tomando como muestra intencionada a 28 estudiantes de primer año, entre 17 y 19 años de edad, de ambos géneros (6 varones y 22 hembras). Se aplicaron métodos teóricos como el analítico-sintético, inductivo-deductivo; del nivel empíricola encuesta, el análisis de documentos y la medición; métodos estadísticos para el análisis de las pruebas realizadas: media, mediana, moda, y rango. Se fundamentó teóricamente desde la Educación Física ofreciendo actividades que ayudan a mejorarla. Se arribó a conclusiones acerca del importante papel de la resistencia aeróbica en los estudiantes de la carrera Ingeniería Química.

Palabras clave: acciones, capacidades, desarrollo, resistencia aeróbica

Abstract
The problem of conditional capacities and their development in man, as a biopsychosocial being, has been a cause of concern and study by researchers from different countries. Among the conditional capacities is the aerobic resistance that has vital importance in the physical preparation of the university student. The objective of the research presented is to propose actions aimed at the improvement of aerobic resistance in the students of the Chemical Engineering career, taking as a deliberate sample 28 first-year students, between 17 and 19 years of age, of both genders (6 males and 22 females). Theoretical methods such as analytical-synthetic, inductive-deductive were applied; from the empirical level to the survey, document analysis and measurement; Statistical methods for the analysis of the tests carried out: mean, median, mode, and range. It is theoretically based on Physical Education offering activities that help improve it. Conclusions are reached about the important role of aerobic resistance in the students of the Chemical Engineering carrier.

Keywords: actions, capacities, development, aerobic resistance

Introducción

Physical Education as a subject, constitutes a process aimed at developing the physical performance capabilities of the individual, based on the morphological and functional performance capabilities of his organism, the training and improvement of his moral and volitional qualities that he has as purpose to contribute to the improvement of young people through physical, sports and recreational activities; it helps the integral formation of the human being; It is the only effective alternative to maintain physiological potentials, physical work capacity, and maintain optimal health (Rodríguez, Moré & Gutiérrez, 2019).

As a discipline it is taught in the first four semesters with a frequency of twice a week, it has the imperative to incorporate new content into the training of university students and apply methods that are adjusted to the specific physical demands that the exercise of profession and the technological advances of the practice in Physical Education, supported by a comprehensive and developer training approach, corresponding to the formation of a culture for working life.

The four subjects of the discipline's program incorporate content for the improvement of physical capacities and the development and improvement of motor skills and sports techniques, as well as the formation and consolidation of volitional and moral qualities in the individual.

Among the physical capacities that are developed through Physical Education is the resistance, that from the point of view of energy expenditure is divided into anaerobic and aerobic resistance playing a fundamental role in the physical state of the university student.

It should be noted that aerobic resistance is one of the fundamental pillars in the physical preparation of every individual throughout his life, which forms one of the four basic physical capacities, and whose benefit is reflected in the body and physical performance.

In the field of Physical Education there is a broad consensus about the educational benefits of practicing aerobic resistance activities, including:

- Those related to the physiological condition, improving the efficiency of the cardio circulatory and metabolic systems, and of the osteoligamentous apparatus, among others.
- Those related to the psychological condition, improving the will, self-discipline and the ability to persevere in an effort, among the main ones.

This type of resistance is also called: Endurance, Aerobic Capacity, Extensive Endurance, Aerobic Power, Cardio respiratory Endurance, Stamina, among others.

Several are the contributions of authors about aerobic resistance and its importance that enrich the theoretical foundations of this capacity, among which stand out: Alonso (2018); Bermeo (2016); Carranza (2006); Estela Raffinov (2018); Galera (2013); González, Zurita, San Román, Pérez, Puertas & Chacón (2018); Najarro (2013); Pereira, Bravo, Flores, Flores, Marin & Santamaría (2018) and Rodríguez (2019).

It has been evidenced in young people that aerobic capacity is inversely associated with different physiological health parameters, such as insulin resistance, adiposity or lipid profile, factors linked to metabolic syndrome and arterial resistance, likewise, the relevance of aerobic capacity as an indicator of cardiovascular risk has been described above other factors already shown, such as cardiovascular problems (Hoyos, Irazusta, Gravina, Gil, S., Gil, J., & Irazusta, 2011; Juránková, Bílý & Hrazdíra, 2015; Lema, Mantilla & Arango, 2016; López-Martínez, Sánchez-López, Solera-Martínez, Arias-Palencia, Fuentes-Chacón & Martínez-Vizcaíno, 2013).

The controls performed show that there are deficiencies in aerobic resistance from the results of the initial physical efficiency test carried out at the beginning of the 2018-2019 school year, the test with the worst results being the 800-meter race; I know They manifested symptoms of fatigue in the students when carrying out physical activities and the lack of a methodological document in the Department of Physical Education and the Faculty of Chemistry-Pharmacy, that allows organizing and dosing actions that respond to the needs of the Chemistry Engineering students for the treatment of this capacity. Hence the need to enhance the treatment of aerobic resistance in the students of this university carrier and as an objective to develop an action plan for the treatment of aerobic resistance in the students of the Chemical Engineering carrier.

The research in its scope is aimed at students and teachers of Physical Education at the Central University "Marta Abreu" of Las Villas so that they can develop the process of this subject more efficiently.

Methodology

Methods were used in the study:

- Theoretical level

Analytical-Synthetical: It allows the theoretical foundation, the selection and elaboration of the instruments, the elaboration and implementation of actions, as well as the synthesis of the results obtained to draw conclusions and recommendations about the theme under study.

Inductive-Deductive: It makes possible to infer and systematize the particularities of aerobic resistance in the educational teaching process.

- Empirical level

The survey: A survey was applied to 1st year students of the Chemical Engineering carrier in two moments of the research (beginning and ending) on the knowledge and importance of aerobic resistance in order to collect the results and see the progress of one survey to another. .

Analysis of documents: Regulatory, methodological documents such as the teaching programs of the subject were analyzed, which together, with investigative works contributed to a greater depth of research.

Measurement: It consists of the process of linking abstract concepts with empirical indicators. In this case, their use allowed to express the results, in numbers. The application of this method gave access to the results of the tests of 800 meters of physical efficiency, and to the values reached by the students during the application of the Cooper test. For the evaluation and classification of the 800 meter test in levels of behavior, the regulations of the Physical Efficiency Tests based on the 90th percentile of the Physical Education Program were used and the Cooper test was evaluated according to age and sex with the normative table of maximum oxygen volume V02 (values of V02 max expressed in ml / kg / min). Cooper, K. (1979).

Statistics: Descriptive statistics was used. Statigraphs such as the mean, median, and mode (measures of central tendency) were used. Rank was also used.

The work was carried out in the following three stages:

First stage: Characterization of the state of aerobic resistance in the first year students of the Chemical Engineering degree. September, course 2018-2019.

Second stage: Preparation of an action plan for the treatment of aerobic resistance in the students of the Chemical Engineering degree. Until December course 2018-2019.

Third stage: Implementation of the proposal. January - May 2018-2019 academic year.

The study is carried out at "Marta Abreu" Central University of Las Villas, worked with a deliberate sample of 28 first-year students of the Chemical Engineering degree, between 17 and 19 years old, of both genders (6 males and 22 females).

Results and Discussion

By characterizing the state of aerobic resistance in the students studied, the following results were achieved:

- The application of the survey and its processing at this point in the characterization showed that of the 28 students surveyed, only 6 knew about the characteristics, characteristics and benefits of aerobic resistance.

The six students who issue criteria about aerobic resistance group their responses as follows:

- 6 expose that it physically develops the organism
- 2 outline that it reduces the risk of cardiovascular diseases.
- 2 refer it improve oxygen transport
- 6 state that it develops through aerobic exercises such as running long distances, jogging, cycling

It is important to note that 22 of the 28 students surveyed are unable to provide criteria about aerobic resistance.

As evidenced by evaluating the results emanating from the applied survey, the results obtained are not satisfactory. It exposes the ignorance of the students of the group about the importance and benefits of aerobic resistance.

- The 800 meter test and the Cooper test were applied to characterize the level of aerobic resistance in the selected sample of students.

Tables one and two are showed below, summarizing the values obtained during the application of both tests and their statistical processing.

Table # 1 shows the result of the statistical analysis of the 800-meter run of the initial test.

Table 1. Statistical analysis of the first Physical Efficiency Test (PEF) 800-meter race

	Male	**Female**
Quantity	6	22
Average	3,19	5,17
Level	III	S/N
Median	3,12; 3,15	5,44; 5,46
Fashion	-	5,35
Rank	0,17	2,25

shows the result of the statistical analysis of the first Cooper test.

Table 2. Statistical analysis of the Cooper test.

	Distance traveled (Male)	**Distance Traveled (Female)**	**V02 máx (Male)**	**V02 máx (Female)**
Quantity	6	22	6	22
Average	2220	1580	38	24
Level	Medium	Very bad	Average	Regular
Median	2200, 2250	1465, 1530	38; 39	21; 23
Fashion	-	1450	-	21
Rank	80	550	2	12

The data that is compared in both tables shows that there were deficiencies in aerobic resistance, in reaching results in these tests that show the low level in the behavior of this capacity in both sexes.

- When reviewing the discipline program, it was found that it does not contain guidelines for the treatment of aerobic resistance. The lack of a guiding methodological document by the department of Physical Education and the faculty of Chemistry-Pharmacy does not guarantee to the Physical Education teacher the clarification of the way to conceive exercises nor actions whose foundation and structure favor the treatment of aerobic efforts in students of these carriers.

Based on the results obtained in the tests and the survey, an action plan is developed to enhance the treatment of aerobic resistance through its consequent application. To undertake the elaboration of the actions that make up the plan, as well as the presentation invariants that the assumed procedure

should contain, it was necessary to summarize some contents that constitute references for its elaboration, such as:

- Main theories linked to the conception of tasks for the treatment of the capacity under study.
- Theoretical - methodological aspects that underlie the treatment of aerobic resistance. Documents of a high informative level are used to build tasks in the assumed scope.
- Models of energy provision for the construction of tasks, used by authors to achieve this purpose.
- Conception and structuring of tasks for the treatment of aerobic efforts.
- Procedures elaborated by other authors to undertake the treatment of aerobic resistance in different contexts of performance.

On the basis of the aforementioned references, the plan was going to be built, which is integrated from theoretical activities and actions that involve the practice of physical exercise.

Table 3 Action Plan for the treatment of aerobic resistance

Actions	Objectives	Participate	Place
Aerobic exercises in the initial part of the class.	Physically condition the body for the main part of the class.	Students Professor	Sports areas
Sports and pre-sports games.	Improve aerobic resistance.	Students Professor	Sports areas
Talks, workshops, conferences	To develop a theoretical knowledge about aerobic resistance	Students Guest professors Professor	Specialized classroom
Athletics Festivals, Cups and Sports Tournaments.	Improve aerobic resistance	Students Professor	Sports areas
Aerobic exercises, dance therapies, Aerobic Musical Gymnastics in free time	Improve physical condition for health	Students Professor Family	Home Specialized premises Student residence
Use of Information and Communication Technologies in the search of bibliographies related to capacity	Develop self-preparation based on the scientific changes that take place on a daily basis regarding capacity development.	Students Professor Family	Home; Faculty, Library; Information Center and Youth Club

Marathons, excursions, walks	Improve aerobic resistance, using physical exercise, using the commemoration of significant dates and the link with nature	Students Professor	Places of social historical interest and Sport areas

Below are shown some reflections that support the preparation of the actions that have been declared and that make up the action plan to enhance the treatment of aerobic resistance in these students. These reflections allow us to use foundations that make it possible to explain trends and regularities assumed during the process of construction of the proposal.

These are:

- Knowledge of the physiology used for the constitution and organization of the contents within the method to be used during the conception, structuring and possible redesign of the tasks. It is necessary for the professor to master aspects such as the density, the time cycle and the duration of the exercise as contents to manipulate during the treatment of this physical capacity, especially in actions where its objective is motor.
- Various actions must be presented, to guarantee diversity within the class.
- Knowing how to reconcile emerging content in the actions designed with the theoretical particularities that allow their treatment, are important aspects to which every professor must aspire to build procedures that guarantee the success of the process and do not constitute a danger to the student's health.
- The professor must show mastery of the regularities that prefix the choice of a task limited by manipulations that can be object and becomes into a procedure to treat aerobic efforts in university students
- It is advisable to conceive and manipulate the range of actions that constitutes a plan with the declared intentions, to know the state with which the student arrives at the class cycle, to deal with any ability oriented towards healthy physical condition because it will constitute a reference to support the organization of a set of activities leading to capacity development. Remember that students usually come from different environments and motor experiences that make each one to be installed at a practice level, almost different.

- The ability to build adequate training tasks is one of the most important qualities that any professor should possess. Having resources in the form of exercises is important, but more is having the ability to create or adapt the right task for each moment.

Once the action plan aimed at enhancing the treatment of aerobic resistance is drawn up, its conceive to be applied during January to May 2018.

The action plan is applied in the conceived period, combining each of the actions contained in the procedure, providing during its implementation a variety of ways and proposals to achieve the intended objective. The actions that presuppose the performance of a physical exercise are harmonized with the actions of a theoretical nature. In May 2018, the instruments designed to determine the effectiveness of the system of influences developed and organized to treat aerobic resistance are repeated, obtaining the following results:

The results of the application of the second survey allow appreciating a better knowledge of the students of the group about the importance and benefits of the practice of aerobic resistance. The 28 students that make up the study group are able to offer references and criteria about this type of resistance, 28 insist that it physically develops the organism, 16 suggest that lung capacity increases, 16 consider that it improves oxygen transport, 14 have the criterion that it reduces the risk of cardiovascular diseases, 12 assume that enhancing its treatment increases the aerobic capacity and function of the heart, 14 reflect that it helps to maintain and improve strength and muscular endurance, and 28 assure that it is developed through aerobic exercises such as running long distances, jogging, cycling and swimming.

Tables 4 and 5 are presented below, which refer to the results obtained by the population under study once they received the influences system designed to treat aerobic resistance.

Table # 4 explains the result of the statistical analysis of the 800-meter run of the second test contained in the Physical Efficiency plan.

Table 4. Análisis estadístico de la segunda Prueba de eficiencia física (PEF) Carrera de 800 metros.

	Male	**Female**
Quantity	6	22
Average	3,05	4,37
Level	II	III
Median	3,02; 3,04	4,50; 4,55
Fashion	-	4,36
Range	0,10	2,05

Table # 5 shows the result of the statistical analysis of the second Cooper test

Table 5. Statistical analysis of the Cooper test

	Distance traveled (Male)	**Distance Traveled (Female)**	**V02 max (Male)**	**V02 max (Female)**
Quantity	6	22	6	22
Average	2505	1900	45	31
Level	Good	Medium	Good	Medium
Median	2500; 2503	1905; 1917	44;45	31;31
Fashion	-	1750	-	28
Rank	65	390	2	8

As can be seen in the tables presented and where the results obtained during the second measurement are limited, in all cases there is an improvement that shows the incidence of the action plan applied in these students to treat aerobic resistance. In the case of the 800-meter race of the second physical efficiency test, both sexes manage to improve the level accredited by the regulations contained in this program, which has as a classifying parameter the time spent, in this case in the 800 meters. Something similar occurs in the results obtained during the application of the Cooper test.

With the application of the action plan to improve aerobic resistance, cognitive physical development of this capacity is achieved in students, evidenced by the results of the tests carried out and the survey.

The average of the statistical results show in the 800-meter race (0.14 male, 0.80 female), the distance traveled (285 male, 320 female) and the maximum volume of oxygen (7 male, 7 female) the increase in the level of capacity development in students.

Conclusions

In order to improve the aerobic resistance presented by the students of Chemical Engineering, an action plan was developed, based on the theoretical-methodological contents, in which ways and ways to achieve this purpose are identified.

With the application of the Action Plan, a development of aerobic resistance can be seen from the Physical Education class, which contributes to a good physical preparation of the future graduate of the Chemical Engineering career.

The proposed Action Plan is pertinent and viable since it is physically developed for the future professional of the Chemical Engineering career.

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