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Original article

## *Program of physical-therapeutic activities for students with cystic fibrosis*

*Programa de actividades físico-terapéuticas para educandos con fibrosis quística*

*Programa de atividades físico-terapêuticas para alunos com fibrose cística*

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### ABSTRACT

The research was carried out in the Jiguaní municipality, Granma province, Cuba. It began, from the limited attention that fibrocystic students receive in the school context due to in the Cuban educational system there is no evidence of physical-therapeutic activity programs that guide the prescription of physical exercises and take into account the



possibilities, potentialities and needs of these children. The objective of the research is to develop a program of physical-therapeutic activities, characterized by a comprehensive physical -educational approach that improves the health-oriented physical condition of students with cystic fibrosis. For its development, a correlational study was carried out, with a pre-experimental design in the period between September 2019 and June 2021. Theoretical, empirical and statistical-mathematical methods were used, as well as research techniques, including: analytical-synthetic, hypothetical-deductive, structural-functional systemic, documentary review, structured observation, expert judgment, interview, methodological triangulation and descriptive and inferential statistics. From an intentional sampling, four students with clinical manifestations of the respiratory tract, low self-esteem and poor physical condition were selected, representing the total population, for 100 %, with an average age of nine years. In the results of the experiment, through the indicators evaluated with the implementation of the program of physical-therapeutic activities, significant changes were observed in 100 % of the sample, thereby improving the health-oriented physical condition in students with cystic fibrosis.

**Keywords:** Physical-therapeutic activities, physical condition, students, cystic fibrosis.

## RESUMEN

La investigación se realizó en el municipio Jiguaní, provincia de Granma, Cuba. Se inició, a partir de la limitada atención que reciben los educandos fibroquísticos en el contexto escolar; pues, en el sistema educativo cubano no hay evidencias de programas de actividades físico-terapéuticas que orienten la prescripción de ejercicios físicos y tengan en cuenta las posibilidades, potencialidades y necesidades de estos niños. La investigación tiene como objetivo elaborar un programa de actividades físico-terapéuticas, caracterizado por un enfoque integral físico-educativo que mejore la condición física orientada a la salud de educandos con fibrosis quística. Para su desarrollo, se efectuó un estudio correlacional, con diseño pre-experimental en el período comprendido entre septiembre 2019 y junio 2021. Se emplearon métodos teóricos, empíricos y estadístico-matemáticos, así como técnicas de investigación, entre ellos: analítico-sintético, hipotético-deductivo, sistémico estructural-



funcional, revisión documental, observación estructurada, criterio de expertos, entrevista, triangulación metodológica y estadística descriptiva e inferencial. A partir de un muestreo intencional, se seleccionaron cuatro educandos con manifestaciones clínicas de las vías respiratorias, baja autoestima y escasa condición física, que representan el total de la población, para el 100 %, con una edad promedio de nueve años. En los resultados del experimento, mediante los indicadores evaluados con la implementación del programa de actividades físico-terapéuticas, se observaron cambios significativos en el 100 % de la muestra, con ello mejoró la condición física orientada a la salud en educandos con fibrosis quística.

**Palabras clave:** Actividades físico-terapéuticas, condición física, educandos, fibrosis quística.

## RESUMO

A pesquisa foi realizada no município de Jiguaní, província de Granma, Cuba. Ela foi iniciada devido à atenção limitada que os alunos fibrocísticos recebem no contexto escolar, uma vez que no sistema educacional cubano não há evidências de programas de atividades físico-terapêuticas que orientem a prescrição de exercícios físicos e levem em conta as possibilidades, o potencial e as necessidades dessas crianças. O objetivo desta pesquisa é elaborar um programa de atividades físico-terapêuticas, caracterizado por um enfoque físico-educacional integral que melhore a condição física orientada para a saúde dos alunos com fibrose cística. Para seu desenvolvimento, foi realizado um estudo correlacional, com um desenho pré-experimental no período entre setembro de 2019 e junho de 2021. Foram utilizados métodos teóricos, empíricos e estatístico-matemáticos, bem como técnicas de pesquisa, incluindo: analítico-sintético, hipotético-dedutivo, estrutural-funcional sistêmico, revisão documental, observação estruturada, julgamento de especialistas, entrevista, triangulação metodológica e estatística descritiva e inferencial. A partir de uma amostragem intencional, foram selecionados quatro alunos com manifestações clínicas do trato respiratório, baixa autoestima e condição física ruim, representando 100% da população total, com idade média de nove anos. Nos resultados do experimento, por meio dos



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indicadores avaliados com a implementação do programa de atividades físico-terapêuticas, foram observadas mudanças significativas em 100% da amostra, melhorando assim a condição física voltada para a saúde dos alunos com fibrose cística.

**Palavras-chave:** Atividades físico-terapêuticas, condicionamento físico, estudantes, fibrose cística.

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## INTRODUCTION

Cystic fibrosis (CF) is an autosomal recessive disease, characterized by chronic pulmonary disorders, exocrine pancreatic insufficiency and a high concentration of electrolytes in sweat (Santana, *et al.*, 2017). It is more frequent in the Caucasian race, with an incidence in this population of approximately 1/5000 live births. It is estimated that one in 25 people of European descent is a carrier of the disease and in English-speaking countries the incidence varies from 1 in 3,000 to 1 in 8,000 live births. Castaños, Pereyro & Renteríaet (2021) refer that this disease "(...) can manifest as asymptomatic, symptomatic or with a wide diversity of symptoms and signs at different ages of presentation, from the newborn to the adult" (p. 18).

In Cuba, its incidence in live births is 1/9000, since only 290 cases have been reported. According to González, Abreu & Rodríguez (2014) the first case was reported, from an autopsy carried out in 1953 by the pathologist of the University of Havana, Dr. Salas Panisello. Furthermore, they state that Dr. Borbolla discovers a patient in 1962 and in 1965, Dr. Mir del Junco reveals another.

Likewise, mention is made of Dr. Rojo and collaborators, who reported three cases investigated in 1970. At the 1974 International Cystic Fibrosis Congress, the casuistry of a group of patients studied at the Pedro Borrás Hospital was narrated. In addition, González *et al.* (2014) refer to the founding of the National Cystic Fibrosis Commission in 1974 itself, by Dr. Rojo and a group of researchers from the William Soler, Centro Habana Pediatric, Infantil Sur de Santiago de Cuba and Pediatric hospital of Villa Clara.



There have been numerous authors, internationally and nationally, such as Blau *et al.* (2002), Bravo *et al.* (2005), Button *et al.* (2016) and Aliño *et al.* (2017) who have studied physical activity in patients with CF; they direct their contributions to improve the symptoms of the disease, through individualized physical exercise, respiratory kinesiology and music therapy as an alternative and playful treatment. However, this knowledge has limitations on the attention to the practice of physical-therapeutic activities as a way to follow in the treatment of students with this pathology.

Among the international studies, those by Blau *et al.* (2002) are included, who developed an intense investigation for four weeks, about lung function, physical exercise and nutrition. At the same time, Miller (cited by Morgan, *et al.*, 2015) carried out a comparative study with the use of autogenic drainage, the active cycle of breathing and postural drainage techniques. For their part, Button *et al.* (2016) focus attention on respiratory therapy as a fundamental pillar for the treatment of the disease, its symptoms and to mitigate the crises.

The studies by Aliño *et al.* (2017) were directed to assess the causes that generate the disease, based on its genetic and multisystemic origin, the different manifestations and how much it can affect various systems and organs of the human body and provide diagnostic and treatment actions. In turn, Mendoza (2018) studied the respiratory manifestations of the disease.

Regarding the Cuban authors, Bravo *et al.* (2005) stand out, who refer to respiratory muscle training for the treatment of CF patients. For their part, Collazo *et al.* (2015) carry out a molecular characterization of the disease in the Cuban population. In the case of Sánchez *et al.* (2019) describe the characteristics of children with CF and the follow-up of survival for 40 years.

Uribe & Lagoueyte (2022) investigate the treatment of fibrocystic patients and refer "Classical management is based on three pillars: antibiotics, respiratory therapy and nutritional control, whose objectives are to keep the airway free of secretion and infection and achieve a healthy state."optimum nutrition" (p.1).



Although some of the studies carried out show the need to practice physical activities for the treatment of these students, they lack theoretical-methodological foundations for their prescription and programming. There is also no evidence of support in a program containing physical activities from the Therapeutic Physical Culture (TPC) and its possible forms of development in the school context. Therefore, the fundamental intention of the research is the elaboration of a program of physical-therapeutic activities, characterized by a comprehensive physical -educational approach, which improves the health-oriented physical condition of students with CF. The activities of the program are based on the criteria of Huerta *et al.* (2018). Program of physical-therapeutic activities for students with cystic fibrosis

## MATERIALS AND METHODS

The present study was developed in two primary schools in the municipality of Jiguaní, province of Granma, Cuba. It lasted two years, from September 2019 to June 2021. It was a correlational study, with a pre-experimental design and intentional sampling; four students with clinical manifestations of the respiratory tract, low self-esteem and poor physical condition were selected, representing 100% of the population, with an average age of nine years. Schoolchildren were selected based on the inclusion and exclusion criteria listed below:

- Inclusion criteria: that they were diagnosed with CF and endorsed by a specialist in pulmonology to carry out physical activities.
- Exclusion criterion: presence of crisis at the time of application of the program.

In this study, 26 mediators (Physical Education teachers, teaching staff from school institutions, health specialists and students' relatives) were also included, who are committed to comprehensive care. Research methods and techniques were used from the theoretical levels (analytical-synthetic, hypothetical-deductive, structural-functional, systemic), for the foundation of the CFT process, in the care of these students and the development of the program.





Empirical methods, such as structured observation contributed to specify the problem under study, its current status and assess the results obtained from the implementation of the therapeutic physical activity program; the analysis of documents facilitated the assessment of referents related to the object of study, such as: medical records, psychopedagogical records and other documents; the measurement allowed obtaining and evaluating the results of the evaluated indicators, before and after the application of the program.

Likewise, interviews were conducted with pulmonologists, physiotherapists, psychologists, educational psychologists, Physical Education and Physical Culture teachers, teachers, nurses, relatives and the family doctor in the role of therapeutic mediators, in order to enrich the characterization of the process of therapeutic physical culture for the care of students with CF; the criteria of experts was applied to thirty experts selected to assess the feasibility of the conception and the program to improve the physical condition oriented to the health of the students with CF.

The methodological and source triangulation was used to compare and assess the results derived from the application of the methods and techniques described; an experiment was carried out, in its pre-experimental variant, with a minimal control design through a pre-test and a post-test, in which, after the first test, the independent variable is handled with the application of the program and later it is evaluated in the final verification and its effectiveness is verified. The statistical-mathematical methods (descriptive and inferential statistics) for the evaluation and practical implementation of the program were also used.

To carry out the diagnosis, two units of analysis were established:

1. Process of physical activity for students with CF in the school context.
2. Assessment of health-oriented physical condition.

In unit of analysis number one, the process of physical activity for fibrocystic students in the school context the evaluation was carried out with the aim of knowing the pedagogical and therapeutic procedures used by teachers for the care and participation of students with CF in the different activities of the school context. For this, research methods were applied,





such as structured observation to evaluate the participation of students in the different physical activities and games that take place in the school context and the interest they show in them.

The interview with Physical Education teachers and main therapeutic mediators, with the aim of obtaining information about the process of care for students with CF and knowing more in detail the characteristics of the disease and its clinical manifestations. The documentary review of the programs of the Degree in Physical Culture and Sport, the therapeutic areas, the clinical histories, the psycho-pedagogical files and the current regulations for the treatment of the disease were carried out.

In analysis unit number two, the health-oriented physical condition was evaluated through the following indicators: trunk flexibility and abdominal strength -endurance, with the exercise and physical condition tests, the maximum oxygen consumption (VO<sub>2</sub> max.) and forced expiratory volume in one second, using the six-minute walk test and lung function tests. For its evaluation, a methodology was established with value scales by levels in each of the tests, which was validated by the specialists, through methodological workshops. Among the materials and equipment used for the evaluation of the condition, the data sheet, the stopwatch, the sphygmomanometer, the stethoscope and the mats were used.

## ***RESULTS AND DISCUSSION***

During the research process, an exchange was carried out with professionals of physical culture, health and the teaching staff where the study was developed; this made it possible to carry out a factual-perceptual diagnosis with the use of different research methods to the process of physical activity for students with CF in the school context, which constitutes the number one unit of analysis.



After obtaining the results of the application of the observation, the interview and the documentary review, they were processed through the methodological triangulation method that yielded the following insufficiencies:

- Students are exempted from Physical Education classes, as a consequence of constant educational limitations.
- Their participation in recreational and social physical activities carried out in the school context is very limited.
- The process is characterized by a transitory care approach and a limited physical conditioning of the affected systems.
- Physical activities are not adapted to the potential possibilities and needs of the students.
- Limited participation of therapeutic mediators in the process of physical and therapeutic care of students with CF, due to ignorance of the disease.
- The existing theoretical conceptions lack a prescription for physical activities, contained in the methodological guidelines and that facilitate individualized work with students in the educational context.

In the second unit of analysis: Evaluation of the physical condition oriented to health, in the diagnosis made to the students under study, in the trunk flexibility test, one of them (25 %) was evaluated at a medium level, while the remaining three (75 %) at a low level. These evaluative results are in correspondence with the appearance of the development of hypertrophic osteoarthropathy and vertebral disorders, caused by this disease limiting said physical quality (Figure 1).

In the abdominal strength-endurance, two students (50 %) were evaluated at a medium level and the other two remaining (50%) at a low level, this result was caused by a decrease in muscular efficiency, due to the limitation of the mitochondrial activity; in addition to the loss of muscle proteins that can appear due to nutritional disorders that are derived from

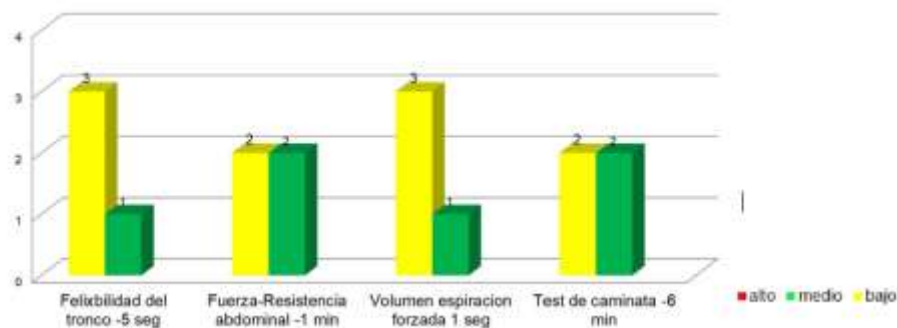


pancreatic alterations and are usually exacerbated by a sedentary lifestyle and the inflammatory phenomenon (Figure.1).

In the six-minute walk test and the maximum oxygen consumption (VO<sub>2</sub> max.) two students (50 %) were evaluated at a medium level and the other two remaining (50 %) at a low level and in the volume of forced expiration in one second, evaluated by pulmonary function tests, one of the students (25%), was evaluated at a medium level, while the remaining three (75 %) at a low level (Figure.1).

These results achieved in the evaluations are related to a dehydration of the airway epithelium, which makes it difficult to clean the secretions in them, due to an excess of mucus in the lungs, leading to a deterioration of lung function, a malabsorption of nutrients and a tendency to bacterial infections, this causes weakness of the peripheral musculature. These symptoms and physiological manifestations are due to the altered cardiopulmonary function that is associated with the disease and hinder the ability to transport oxygen during a prolonged period of continuous activity.

With the analysis of the investigative background and the results obtained in the diagnosis, it is possible to state that the care of students with CF requires a program of physical-therapeutic activities to improve the physical condition oriented to health that includes the participation of therapeutic mediators, in addition to the Physical Education teacher as the main link in the process.



*Fig. 1. - Initial diagnosis of physical condition*

*Source: Bravo et al. (2005); Huerta Ojeda et al. (2018)*



*Proposal. Program of physical-therapeutic activities to improve the health-oriented physical condition in students with cystic fibrosis*

General objective: to improve the physical condition of fibrocystic students, through physical-therapeutic activities in the school context.

Stage I. Preparation of students in physical-therapeutic activities and their incorporation into them (Table 1).

General objective of the stage: prepare children with CF with health education activities related to the disease and adaptation to the practice of physical-therapeutic activities.

Specific objectives: to cultivate in the students the aspects related to the disease and what refers to therapeutic physical activity; determine the biopsychosocial characteristics of the students; improve the physiological state of the organism; re-educate breathing; prepare the organism for the subsequent physical load and apply the physical-therapeutic activities in this stage, in correspondence with the potentialities, possibilities and needs of the students.

Duration: three months. The duration depends on the assimilation process of the student and the fulfillment of the proposed objectives.

Weekly frequency: three to four frequencies.

Stage II. Physical-therapeutic care. The stage begins at the end of the third month of work, where the condition achieved in the previous stage must be maintained (Table 2).

General objective: to improve the health-oriented physical condition of students with CF.

Specific objectives: increase cardiorespiratory capacity; develop muscle strength; increase and improve flexibility; improve the psychosocial aspects and apply the physical-therapeutic activities corresponding to the stage.



Duration: after the three months have passed, this stage lasts for life, as long as there are no complications or negative outcomes that lead the student to a hospital admission; otherwise, it should be started with the first stage of the program.

Weekly frequency: 3 to 5 sessions per week.

*Table 1. - Distribution of the content of the classes in the first stage of the program*

Content	Class sessions		
	1 to 10	11-20	21 to 30
<b>Educational talks</b>	8-10 minutes	8-10 minutes	8-10 minutes
<b>General physical development exercises</b>	8-10 minutes of 6 to 8 repetitions each	8-10 min., 6-8 repetitions each	8-10 minutes of 6 to 8 repetitions each
<b>Joint mobility exercises</b>	8-10 minutes of 6 to 8 repetitions each	8-10 minutes of 6 to 8 repetitions each	8-10 minutes of 6 to 8 repetitions each
<b>Respiratory reeducation exercises</b>	10-20 minutes, 2 sets/ 8 repetitions	10-20 minutes, 2 sets of 8 repetitions	10-20 minutes, 2 sets of 8 repetitions
<b>Relaxation exercises and techniques</b>	5 to 10 minutes 2 sets/ 6 to 8 repetitions	5 to 10 minutes, 2 sets of 6 to 8 repetitions	5-10 minutes, 2 sets/6-8 reps

*Table 2. - Distribution of the content of the classes in the second stage of the program*

Contents	Class sessions		
	1-10	11-20	21-30
<b>Educational talks</b>	10-15 minutes	10-15 minutes	10-15 minutes
<b>Joint conditioning exercises</b>	8-10 minutes of 3 -6 repetitions each	8-10 minutes of 3-6 repetitions each	8-10 minutes of 3 -6 repetitions each
<b>Respiratory reeducation exercises</b>	15-20 minutes of 6-8 repetitions each	15-20 minutes of 6-8 repetitions each	15-20 minutes of 6-8 repetitions each
<b>aerobic activities</b>	4-6 minutes, 2 sets of 6 repetitions of each exercise	6-8 minutes 2 sets of 6-8 repetitions each	6-8 minutes 2 sets of 6-8 repetitions each
<b>Exercises for the development of muscular strength</b>		15-20 minutes of 6 to 8 repetitions each	15-20 minutes of 8 to 12 repetitions each
<b>Exercises for the development of flexibility</b>		15 to 20 minutes of 8 to 10 repetitions each	15 to 20 minutes of 10 to 12 repetitions each
<b>Relaxation exercises and techniques</b>	5 to 10 minutes of 5 to 6 repetitions each	5 to 10 minutes of 5 to 6 repetitions each	5 to 10 minutes of 5 to 6 repetitions each
<b>Complementary activities</b>		30 to 60 minutes	30 to 60 minutes



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*Methodology to follow in Therapeutic Physical Culture classes*

The session consists of three parts: initial, main and final with a duration of 45 to 60 minutes; it is suggested at least three frequencies in the week and no more than five. It should be worked with a frequency of moderate intensity.

Initial part: this is the orientation and previous preparation part, the student is prepared to face the activity that he is going to develop, a favorable environment is created for the practice of physical activities, the respiratory and cardiovascular system is conditioned, as well as to all joints and muscle planes for the main part. The formation and presentation of the group is carried out, an educational talk, the explanation of the elements to be worked on and the information on the objectives of the class, the pulse is measured, joint mobility exercises, warm-up and stretching and walking with breathing (inspiration and expiration). Its duration is 10 minutes.

Main part: it constitutes the fundamental moment of the session and it is where the objectives are met; in this sense, exercise is the main element, it must be aimed at the development of habits, skills and capacities and in it, it is recommended to use within the proposed exercises, those of great energy expenditure and workload, so it is essential organize exercises that favor the development of capacities; as well as those of respiratory reeducation, exercises for the development of physical condition, respiratory reeducation and aerobic activities. The duration time must be between 30 and 35 minutes, the characteristics of each student are taken into account, a moderate pace of execution and pulse measurement.

Final part: it is aimed at recovery, the student recovers until reaching the approximate values of the activity; in addition, stretching, breathing, muscle relaxation exercises, slow walking with two-phase breathing (inspiration and expiration), muscle relaxation techniques and pulse measurement should be carried out. Duration five minutes.

*Descriptive components of the physical-therapeutic activities in the program*

(The prescription of the activities is in correspondence with the clinical manifestations, age and the possibilities of the students).



- Type/Mode of activity: Respiratory re-education exercises, strength exercises, relaxation techniques, aerobic activities, flexibility exercises, marches and complementary activities.
- Intensity: 40 to 60 % of maximum heart rate.
- Duration: 50 to 60 minutes of activity.
- Frequency: Three to five times a week.
- Progression: adjust the total work by sessions, gradually increasing in intensity and duration. The work-rest relationship is worked on, the activity being carried out is always taken into account.

#### General methodological indications of the program

1. For the application of the program, a prior diagnosis must be made to the students for the biopsychosocial characterization, so as to guide the Physical Education teacher on the level of involvement of the disease and the characteristics of the physical-therapeutic activities to be developed.
2. Know the fundamental clinical elements for the treatment of the disease, which facilitate a good interaction with the therapeutic mediators and the students involved in this activity.
3. Certify the presence of the therapeutic mediators and the family during this process, so that the student feels confident and has a pleasant atmosphere.
4. Students must hydrate during and after the exercise session.
5. Respiratory reeducation exercises must be carried out from the simplest to the most complex, daily and at least twice a day. Breathing should be abdominal or diaphragmatic.
6. The explanatory-demonstrative method must be used as a method and, at all times, correct errors and attend to individual differences.





7. Aerobic activities must be carried out in a fun way and with an easy execution, which allows them to be increased and practiced regularly, with a moderate intensity from 40 to 60% of the maximum frequency, to avoid fatigue.
8. Promote the improvement of physical condition based on physical and psychosocial health, as well as the prevention of possible complications.
9. The work must be carried out, preferably in a group to facilitate and stimulate interaction and exchange between students and therapeutic mediators.
10. The students should not go from one stage to the other, without meeting the objectives established for this period.
11. These students must be evaluated periodically by the pulmonologist, based on established indications that must be taken into account for the prescription of physical activities.

#### Contraindications for the application of physical-therapeutic activities

- Acute febrile states.
- In case of acute pulmonary exacerbation.
- Recent lung transplant.
- Inflammatory and infectious processes.
- Tachycardia.
- Rising or falling vital indices.
- Muscle injuries and fractures.
- Hypoglycemia.
- Excessive cough.
- Medical ban.



*Final result. Evaluation of the physical activity process for students with cystic fibrosis in the school context*

The final evaluation of the physical activity process for students with CF, through the use of selected scientific research methods and the deep assessment of the criteria, found that:

- 100 % of the students joined the therapeutic classrooms of physical culture.
- The medical staff expressed that the program influenced the physical and psychosocial health of the students, by reducing the number of crises, admissions and the ingestion of medications,
- The link between Public Health Ministry- Education Ministry-National Institute of Sport Physical education and Recreation was strengthened.
- The Physical Education teachers who applied the program stated that it constitutes an essential tool to improve the health-oriented physical condition of students with CF.
- The relatives stated that they were satisfied with the physical, psychological and social transformation achieved by the students after applying the program.

*Health-oriented condition evaluation*

After applying the program, the results of the physical condition evaluated in the four students under study were verified. In the trunk flexibility test, two of the students (50 %) passed to a medium level, one (25 %) to a high level and only one (25 %) remained at a low level.

This increase in the evaluative results reached, was achieved by the continuous work carried out with the physical activities prescribed in the program in correspondence with its clinical diagnosis, possibilities and potentialities, which helps to avoid injuries and prevent bad postures due to muscular shortening, this coincides with the results achieved by Huerta *et al.* (2018) on the application of physical activities aimed at the mobility and elasticity of the



coxofemoral joints and lumbar flexion in children with cardio-respiratory disorders who had a sedentary life as a result of the diseases they presented (Figure 2).

In the abdominal strength-endurance, after applying the program, three students (75 %) reached a high level in their evaluation and only one of them (25 %) was evaluated at a medium level, this brought as a result that they managed to increase the number of sit-ups performed in one minute, which allowed an increase in the dynamic resistance strength of the abdominal muscles and these results coincide with what was achieved by Huerta et al. (2018) in their research, since physical activity was applied continuously and dynamically in the abdominal muscles, in correspondence with the clinical diagnosis, possibilities and potentialities of the sick practitioners, in order to strengthen the anterior rectus and oblique abdomen.

Regarding the six-minute walk test and forced expiratory volume in one second, after applying the program, three of the students (75 %) passed to a high level due to the systematicity of the applied physical-therapeutic activities, which made it possible to strengthen the respiratory processes, improved the transportation of oxygen and the capacity of the cardiovascular system, favored a better work for the heart and lungs. These results coincide with what was stated by Bravo *et al.* (2005) who highlights in their research the incidence of therapeutic aerobic physical activity in children with cardiovascular and respiratory diseases. Only one student had a low level (25 %), this coincides with the results achieved in some of the indicators evaluated due to an unfavorable physical condition presented by the disease (Figure 2).



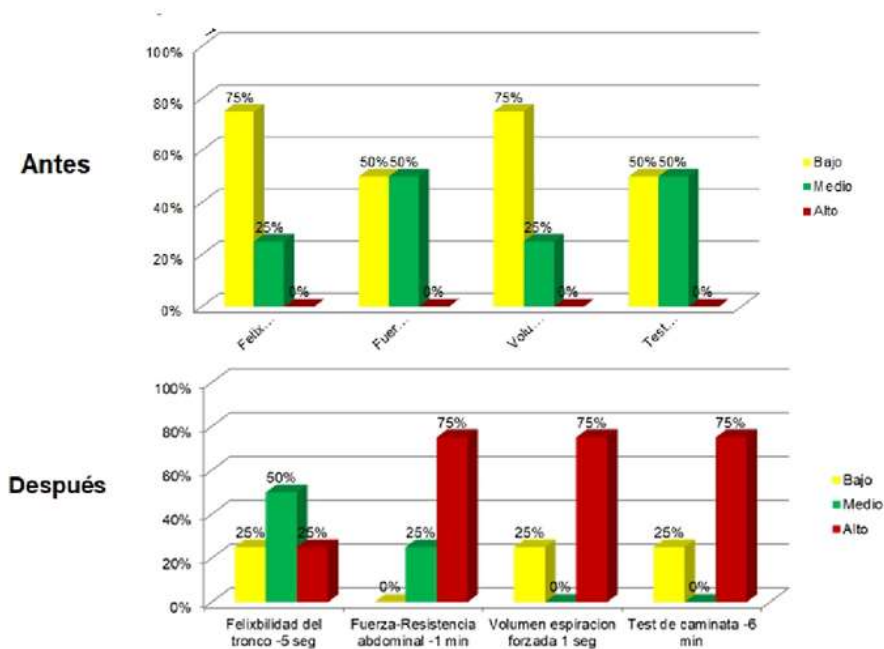


Fig. 2. Initial and final comparison of the physical condition evaluation

Source: Bravo et al. (2005); Huerta et al. (2018)

The results are reflected in (Figure 2) that coincide with the results of the Wilcoxon signed rank test, which demonstrates its significant value from the statistical point of view.

Patients with CF present with the progression of their disease a low tolerance to exercise (Casajús & Vicente, 2011). Gait tests are simpler and are used to assess exercise tolerance, assess disability and assess the response to certain treatments according to Butland (cited by Casajús & Rodríguez, 2011).

In a different way, exercises have been applied to patients with CF, for example, Klijn *et al.*, (cited by Casajús & Rodríguez, 2011) applied a high intensity exercise program, two days a week for 12 weeks and determined improvements significant, both in aerobic and anaerobic performance and in the quality of life of patients.

In any case, regular physical exercise has been proposed in these patients to improve lung function, aerobic and anaerobic capacity, respiratory muscle strength, clearance of sputum airways or decrease lung deterioration, to improve the quality of life and survival rates (Casajús & Rodríguez, 2011). Therefore, according to Casajús & Rodríguez (2011) "The



exercise must be prescribed in an individualized way according to the degree of motivation, tastes and time availability" (p.275).

## CONCLUSIONS

In general, the comparison of the presented results showed that the four indicators of the physical condition oriented to health and conceived in the pre-test were evaluated at a low and medium level, while in the post-test these indicators managed to increase evaluations at a medium and high level, which corroborated significant quantitative and qualitative changes.

The results obtained from the practical implementation of the PTA program, allowed to improve the health-oriented physical condition in students with CF, when observing changes in the different indicators evaluated, this was propitious for their inclusion in therapeutic classrooms.

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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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