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STRATEGIES FOR REHABILITATION OF CHILDREN DIAGNOSED WITH SCOLIOSIS USING KINETIC METHODS

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Abstract

Early detection of scoliosis can get an immediate and appropriate treatment for it and, in an ideal approach, the rehabilitation programs should be carried out during the school-age period. A worrying thing is the lack of movement, which has made its considerable mark on children, observing how some of them have right C scoliosis. In this research, we want to highlight the effectiveness and applicability of therapeutic physical exercise by implementing physical therapy programs that, over time, could lead to a decrease in the number of patients suffering from this condition. The rehabilitation program must be structured according to the pathology of each subject and also must take into account the methodological principles specific to the physical therapy field, from simple to complex, from unknown to known, and from easy to difficult. We want to point out that the only function performed by the physiotherapist is to help the patient with spinal deficiencies to regain his physical and mental health. The physiotherapist must also intervene in maintaining the results obtained from the systematic application of kinetic programs, to restore the patient's confidence in his physical strength and, at the same time, speed up his socio-educational reintegration. Physical therapy contributes significantly to improving the functional status of children diagnosed with scoliosis and allows an improvement in the quality of life with remarkable effects in terms of participation in personal and social life.

Keywords: Breathing, children, exercises, muscle toning, scoliosis

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1. Introduction

Early detection of idiopathic scoliosis is an important factor in determining an immediate and appropriate treatment (Negrini et al., 2012). Making a usage of the Adams test can be detect in the clinical examination the angle of trunk inclination (Bunnell, 1993; Grivas, 2013; Huang, 1997). We can say the school screening for determining vertebral static disorders made by experienced staff it is really important in early diagnosis of spinal dysfunction, however, the most effective is the one made through orthopedic, pediatric or physioterapeutic examination (Bunnell, 1984; Grivas et al., 2007; Lonstein et al., 1982; Montgomery et al., 1990; Pruijs et al., 1992; Torell et al., 1981). With a lot of progress being made in diagnosis, it is believed that in 0.1% of children with scoliosis, the Cobb angle reaches over 40◦. This is a reason of a small number of children diagnosed with scoliosis in the initial stage of the disease, being estimated to be only 30% to 78% of total patients (Côté et al., 1998; Kotwicki et al., 2009; Lee et al., 2010).

The risks of progression and their significant repercussions in adulthood make screening and monitoring spinal deformities in children two imperatives that should not be underestimated. Preventive school medicine is the first screening. But the specialist's medical diagnosis and especially the complete, precise, repetitive, and comparative medical and physical therapeutic control will make possible the option for the best available therapy and the evaluation of the prognosis specific to each case. The therapeutic team (medical doctor, surgeon, physical therapist, and orthopedic surgeon) must be united to allow a close collaboration to provide the appropriate treatment and monitoring for each child.

The most correct and important clinical interpretation is made when we use the X-ray image of the spine, an well- developed prognostic model, taking into account Cobb's angle, the age, gender etc. (Grivas et al., 2006).

The morphological differences in the three-dimensional spinal deformity make the results of the clinical examination to be more difficult to appreciate. All these differences are specific to each curvature (Czaprowski et al., 2011; Grivas et al., 2018; Homans et al., 2021; Hawes & O'Brien, 2006; Kluszczyński, 2007; Lonstein & Carlson, 1984).

2. Problem Statement

Early-onset spinal disorders occur in children in a vulnerable ontogenetic stage and are a unique and challenging dilemma, as the spine, thorax, and lungs are still developing, and it is essential to allow proper development of the viscera. Managing scoliosis or kyphosis with early-onset is a major challenge, as the child is still growing, and any intervention is only temporary. Treatment in these cases is an interprofessional care approach based on a multidisciplinary team (LeFever & Menger, 2022).

Scoliosis is an example of a tri-planar, biomechanical dysfunction. In its most common form (90% of the cases), right thoracic convexity and left lumbar convexity (Figueiredo & James, 1981; Wynne, 1968) exemplify the extreme progression of normal human asymmetry according to the PRI model. Other postural disorders such as kyphosis and lordosis, exhibiting primary sagittal plane dysfunction, also belong to the spectrum of disorders developing from unbalanced human asymmetry. These conditions

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result in musculoskeletal stress, subsequent structural damage, loss of efficiency in movement, and respiratory function as well as in a diminished quality of life.

In recent decades, there has been a change while talking about the stakeholders involved in scoliosis management (Schreiber et al., 2015). New treatments are being sought by physical therapists, but some of them are not yet properly educated and equipped to provide valid treatment for scoliosis. They are currently looking for more effective solutions to such problems (Weiss et al., 2013).

3. Research Questions

The purpose of this study is to elaborate, implement and validate an intervention based on specific programs of exercises with prophylactic benefits in the case of toddlers and adolescents diagnosed with spinal deficiencies.

We strongly believe that it is very important to take action at a very young age to assure a better development of children's motricity, and also to prevent common physical deficiencies and their effects on the participation in daily living activities, with significant deteriorations when it comes to the quality of life. An essential objective of the physical therapy interventions refers to the stimulation of the development of motor capabilities and contributing to the change in young people's health and lives. Through this process of kinetoprophylaxis, a various number of age-specific programs must be used and exploited; for example, the need for movement, competition, affirmation, harmonious physical development, etc.

4. Purpose of the Study

The aim of the research is to establish the effectiveness of the rehabilitation program for the treatment of patients diagnosed with right C scoliosis. Through this paper, we want to show that the unique function performed by the physical therapist is to help the patient with spinal defects to regain physical and mental health. Also, the physical therapist must intervene in maintaining the results obtained from the systematic application of kinetic programs to restore the patient's confidence in his physical forces and also to hasten his socio-educational reintegration.

5. Research methods

This is a case study research that was conducted in a private rehabilitation clinic. The subject included in our study was a 11-year-old child (girl).

In table 1, we find measurements and tests that were first applied to determine the initial functional state and, subsequently, to highlight the evolution of the specific parameters investigated from the physiotherapist's perspective.

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Table 1. Values of the investigated parameters at the initial and final testing

Investigated parameters	Initial testing	Final testing
Height (cm)	150	152
Weight (kg)	32	35
IMC: $\frac{\text{weight (kg)}}{\text{height (m}^2\text{)}}$	14,2	15
Resting chest perimeter (cm)	72	73
Thoracic perimeter in forced inspiration (cm)	75	77
Chest perimeter forced exhale (cm)	71	72
Spirometry (L/min)	300	330
Cobb Angle (grade)	10	8
The vermouth (cm)	147	148
The Schober test (cm)	18	20
Right lumbar lateral flexion (cm)	20	22
Left lumbar lateral flexion (cm)	17	19
Homogeneous asymmetry (cm)	2	1
Asymmetry of the thoracic fold (cm)	2	0,5
Asymmetry of sacred dimples (cm)	0,5	0,5
Interfesier trench deviation (cm)	0,58	0,5
Scoliometer measurement (grade)	20	7
Perimeter: - right arm (cm)	20	21
- left arm (cm)	19	20
- right forearm (cm)	18	19
- left forearm (cm)	17	18
- right tight (cm)	32	33
- left tight (cm)	32	33
- right calf (cm)	16	16
- left calf (cm)	32	33
The length of the right upper limb (cm)	50	51
The length of the left upper limb (cm)	50	51
The length of the right lower limb (cm)	67	68
The length of the left lower limb (cm)	67	68
Goniometry (grade):		
- measurement of lumbar flexion	100	108
- measurement of lumbar extension	10	12
- measuring the right lumbar lateral flexion	20	22
- measurement of the left lumbar lateral flexion	17	18

Body mass, height, perimeters, and mobility have recorded higher values in the final testing compared to the initial ones. For spine mobility, the scores obtained suggest an improvement in the degree and direction of rotation of the vertebrae. Also, we can observe progress in the position of the pelvis relative to the vertical axis of the body. Moreover, the displacement is less expressed.

There are certain types of exercises that are efficient for children with scoliosis. Some of these types of exercises are mentioned in the following lines:

i. Static exercises, which consist of asymmetric positions of the body, are derived from the fundamental positions of sitting, on the knees sitting, lying, and hanging, which aim to correct the curves of the spine, an essential condition for performing corrective exercises in dynamic form.

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ii. Dynamic exercises, in the form of movements of the trunk and limbs, performed in the direction of rectifying the spine and other segments of the body in the correct attitude, such as:
iii. exercises for the trunk in the form of lateral bending on the convexity side, extensions, twists with the extension on the concave side, as well as stretching movements of the trunk in the long axis of the spine;
iv. arm exercises - they have an asymmetric structure, consisting of asymmetric fixes and showers;
v. exercises with the lower limbs, which also have an asymmetric structure; the leg on the side of the concave performs extension movements, and the one on the side of the convexity performs fixations and flexion showers; breathing exercises, aimed at providing the body with the necessary oxygen and helping to correct the attitude of the chest.
vi. Exercises with portable objects and fixed devices. As portable objects, the cane is used to fix the torso, column, and e-mint of the scapular belt in the correct attitude, the medicinal balls, to amplify the movements of the trunk and limbs and to increase the peripheral resistance of movements. For the same purpose, elastic cords and other objects are used. Among the frequently used machines we mention the bench, bench seat, ladder, oblique plane, balance platform, multifunctional apparatus, and others;
vii. Applied exercises with corrective content, such as walking, balance, crawling, etc.

All these exercises constitute an experiment-type rehabilitation program with independent variable intervention, which can be applied three times a week, with a total duration of 50 – 60 minutes per session.

The applied program work containing means, methods, and techniques specific to rehabilitation has positively influenced several motor and functional indicators. Thus, we emphasize significant improvements in posture, shoulder line, pelvis line, and head position, recording any significant progress.

6. Findings

The age of the patient is important in finding the right treatment, while still the rehabilitation programs objective is the same: slow down and/ or halt the curve progression. Talking about children and adolescents, for them, the key is self- correction, as they can reduce the progressive deformation of the vertebrae while the spine is still growing. The plasticity of the bones comes to an end when the skeletal growth and bone vertebral deformities are fixed.

The primary treatment purpose in adults its to stabilize the spine and prevent further curve progression, comparing with the children where the goal was to realign and reduce magnitude of the curve The self-correction is performed by all the patients, having as purpose not to reduce curve magnitude as for the children, but rather to stabilize the spine and prevent curve progression. Some other helpful tips coming for the corrective movements are represented by the controlled breathing mechanics.

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7. Conclusions

Having in mind all the aspects mentioned above, we can extract the following conclusions:

i. the application of physical therapy programs could lead to a decrease in the number of patients suffering from scoliosis over time;
ii. the techniques used in physical therapy programs aim at toning the back muscles in a regimen either shortened by the side of the convexity (right), or in an elongation regime on the side of the cavity (left);
iii. the kinetic programs used in the rehabilitation of patients with scoliosis in the right "C" can influence patients both physically and mentally, contributing to a higher quality of life;
iv. following the systematic application of kinetic methods and techniques within the rehabilitation program, an improvement in spine mobility, a correct attitude of the whole body, and optimal physical and mental status was observed..

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