



## THE IMPORTANCE OF PHYSIOTHERAPEUTIC RESOURCES FOR CHILDREN AND ADOLESCENTS WITH IDIOPATHIC SCOLIOSIS *THE IMPORTANCE OF PHYSIOTHERAPEUTIC RESOURCES FOR CHILDREN AND ADOLESCENTS WITH IDIOPATHIC SCOLIOSIS*

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### SUMMARY:

Idiopathic scoliosis is the most common pathology in adolescents and children, accounting for 80% of scoliosis cases. Physiotherapy treatment serves to prevent, improve pain and increase quality of life, improving muscle strengthening, mobility and range of motion in the spine. This article performs a systematic review of articles published between 2015 and 2024, considering the Ânima University (RUNA), SciELO and LILACS databases. It presents some case studies and randomized clinical trials that investigate the application of the Global Postural Reeducation (RPG) and Pilates methods in reducing scoliosis curvature in children and adolescents. In total, 15 studies were selected, but of these, 5 were excluded, leaving 10 scientific productions that were consistent with the objectives of the study. The results indicated a significant reduction in curvature in both methods.

**Keywords:** Pilates. Global Postural Reeducation (RPG). Scoliosis. Children and Adolescents.

### ABSTRACT:

Idiopathic scoliosis is the most common pathology in adolescents and children, prevailing in 80% of scoliosis cases. Physiotherapy treatment serves to prevent and improve pain and quality of life by improving muscle strengthening, mobility and range of motion in the spine. This article carries out a systematic review of articles published between 2015 and 2024, using the Ânima University (RUNA), SciELO and LILACS databases. It presents some case studies and randomized clinical trials investigating the application of Global Postural Reeducation (GPR) and Pilates methods in reducing the curvature of scoliosis in children and adolescents. A total of 15 studies were selected, but of these, 5 were excluded, leaving 10 scientific productions that were consistent with the objectives of the study. The results indicated a significant reduction in curvature in both methods.

**Keywords:** Pilates. Global Postural Reeducation (GPR). Scoliosis. Children and Adolescents.

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## 1. INTRODUCTION

The purpose of this research is to demonstrate the importance of physiotherapy in the treatment of idiopathic scoliosis in children and adolescents. The aim is to identify the physiotherapy techniques and methods that are most effective in reducing curvature in idiopathic scoliosis in children and adolescents, aiming to improve pain and provide other benefits to patients with this condition.<sup>1</sup> According to Tribastone, in 25-30% of cases of scoliosis, the pathology is known. There are three types of scoliosis: congenital, traumatic, and functional. However, in 70-75% of cases of scoliosis, the pathology is unknown and is therefore classified as idiopathic, which means that the type of dysfunction manifests itself without apparent extrinsic causes.<sup>22</sup>

In the physiotherapy evaluation, scoliosis can be detected by the Adams Test, in which the patient in an upright position leans the trunk forward with the hands together, feet together and knees straight. The difference in height in the chest or any other asymmetries of the segments may indicate the presence of scoliosis.<sup>1</sup>

There are several resources that the physiotherapist himself can use for patients with idiopathic scoliosis, as well as exercises and physiotherapy methods. Among the various possible physiotherapy methods for treatment, the following stand out: Global Postural Reeducation (RPG), Pilates.<sup>1</sup>

It is a postural re-education and alignment based on exercises that help stabilize the spine and strengthen the paravertebral muscles. They are actively performed by the patient, requiring contraction of the deep muscles of the spine in the 3 planes of space (axial, sagittal and coronal), without the help of external agents, in which the patient needs to maintain precise control of the movements.<sup>2</sup>

Therefore, this study aims to illustrate the importance of physiotherapeutic resources for children and adolescents with idiopathic scoliosis. To this end, the following specific objectives were defined for the research: to identify physiotherapeutic resources for morphology correction, stiffness suppression and joint release, such as: RPG and Pilates; to describe the importance of stretching, isotonic and isometric contractions to target the paravertebral muscles and their contributions to reducing scoliotic curvature; and to point out the benefits of therapeutic methods and techniques for strengthening and recovering the spinal stabilizers of children and adolescents.

## 2 THEORETICAL FRAMEWORK

### 2.1 ANATOMY AND PATHOPHYSIOLOGY OF IDIOPATHIC SCOLIOSIS

The spine is a long structure that connects to the axial skeleton, along with a structure and segments that make up the musculoskeletal system in the spine, with the purpose of supporting overloads. The spine is separated into four segments by specific number in each vertebra, such as: cervical vertebra (C1-C7), thoracic vertebra (T1-T12), lumbar vertebra (L1-L5) and sacral vertebra (S1-S5). In biomechanics, there is flexion and extension (sagittal plane), laterally, right and left (coronal plane) and concluding with rotation and circumduction (transverse plane).<sup>1</sup> Although rotation occurs more in the cervical and lumbar vertebrae in relation to the thoracic vertebra. Scoliosis is defined as a degenerative alteration of the spinal column and is characterized as a pathological curvature, as it interferes because it is a three-dimensional deformity that affects the three planes; the vertebrae tend to tilt in the frontal plane, rotate on their axis in the axial plane and are placed in posteroflexion in the sagittal plane.<sup>2</sup>

There are two types of scoliosis: functional or non-structural, in which there is no curvature; and structural or morphological scoliosis, in which there is a pathological curvature that alters the longitudinal axis. Both affect the musculoskeletal structure.<sup>3</sup> Another factor that may occur is a lack of equality of the lower limbs or through an incorrect step that can directly influence the musculoskeletal system, contractions or pain in the muscles of the spine due to compression of the nerve root is sometimes related to poor posture.

During adolescence, bodily changes occur, however, girls are more likely to have a change in their spine than boys. During the growth period during puberty, as a result of hormones that allow for a major change in bone structure, this is the time when muscles are formed. It is clear that the causes of idiopathic scoliosis pathologies in adolescence affect more females.<sup>4</sup> In this development, numerous changes of a social, psychological and above all physical nature for this population. It is noted that the transport of excessive overload from the use of backpacks, inadequate postures, sedentary lifestyle,

these and several other factors contribute to the development of scoliotic curvature which can be harmful to the postural issues of these children and young people.<sup>5</sup>

Idiopathic scoliosis is a term that was adopted in medicine by Kleinber in 1922 to refer to patients with scoliosis whose onset of the disease cannot be identified. It is divided into four groups according to the age range in which it is first diagnosed, in intervals of Infantile for children under 3 years of age; Juvenile for children over 3 and under 10 years of age; Adolescent for patients between 10 and 18 years of age. years; Adult if over 18 years of age.<sup>6</sup> Physiotherapy is the science that studies the body human, contribute greatly to their role in rehabilitating children and adolescents with idiopathic scoliosis, as it correctly results in bringing satisfaction of well-being, quality of life, considered a conservative procedure, and may include patients with a smaller curve, without the presence of surgical indications.<sup>7</sup>

It is suggested that treatment be carried out to prevent the progression of the curvature, and thus a means of treatment or resources can be carried out, therefore, orthopedic braces are widely used for this purpose. This applies to curvatures between 25° and 45° since they are considered less severe, the brace will be used to prevent worsening and rectify the scoliotic curvature, being little effective in adults, the use of braces also aims to minimize the need for surgeries. However, during the physiotherapy treatment, if there is a decrease in the curvature, it is recommended to disengage from the orthopedic brace and focus on toning and strengthening the muscles in the spine.<sup>8</sup>

## 2.2 THE RPG METHOD FOR CHILDREN AND ADOLESCENTS WITH SCOLIOSIS

Idiopathic scoliosis, with no known cause, is the most frequently encountered form in healthy children and adolescents.<sup>9</sup> Obviously before starting treatment, the physiotherapist will carry out a complete assessment of the anamnesis, examinations of retractions, proportion points and the selection of the position that will be worked on with the patient.<sup>10</sup> In the examination, the case clinically it is only considered scoliosis if the curvature angle is at least 10°, measured through the anteroposterior radiological image of the spine by the Cobb angle.<sup>11</sup> However, the physiotherapist needs to know when the pain increases or bothers you the most. Likewise, mode that requires advancing physiotherapeutic treatment in accordance with the

development and evolution of the patient, and a new evaluation may be carried out in each session, prioritizing postural improvement.<sup>10</sup>

According to Marques et al. (2011), physiotherapy uses several techniques to correct postural changes, for example: the Global Postural Reeducation (RPG) method, which is a resource that aims to establish muscular strengths for the composition of the structure in the human body, to restore the ability of joint movement and maintain good posture.<sup>12</sup> In addition, RPG helps to restore the stability of the muscles in the spine through stretching, muscle contraction, body awareness and posture correction. Therefore, the basic principles of RPG in idiopathic scoliosis are to increase the flexibility of static muscles; reduce joint compaction through traction; lengthen what is shortening and strengthen what is lengthening, in general the static muscles, releasing the respiratory block.<sup>13</sup>

Physical problems and complications can happen to children and adolescents during puberty. If not evaluated, examined and diagnosed in time, serious problems can occur. This can contribute to increased risk and can result in serious deformities, affecting physiognomy, cardiopulmonary function and well-being psychological air.<sup>9</sup> Due to, At this stage, musculoskeletal development occurs, ensuring more appropriate postural patterns throughout life becomes more likely, making it beneficial, as exemplified by Martelli and Traebert (2004), making prevention and treatment for modifications more practical. postural changes than in adulthood, when changes can worsen and become irreversible.<sup>5</sup>

Junior and Tomás, had good results in two groups with healthy individuals: A and B, Group A was subjected to two RPG postures (Frog in the Air and Frog on the Ground) in total for 30 minutes, unlike Group B, which was not subjected to any treatment. The studies revealed positivity to RPG treatment in three categories: cervical alignment, thoracic scoliosis and lumbar scoliosis -in 47.92% in the GE, and only 4.2% in the GC.<sup>14</sup> Studies carried out regarding the use of the RPG Method with children between 10 and 14 years of age, a period related to the growth spurt, presented significant results promoting the reduction of the scoliotic curve, improving the ROM of the shoulder joint and providing flexibility of the posterior chain in an adolescent patient with scoliosis idiopathic.<sup>5</sup>

### 2.3 THERAPEUTIC INTERVENTION THROUGH PILATES

The Pilates Method was developed by the German Joseph Hubertus Pilates (1880-1967) during the First World War (1914-1918), initially called “Contrology”, results in concepts related to the notions of concentration, stability, perception, control body, amplitude, strength and muscle tone.<sup>15</sup> Pilates works the body in a globalized way, According to Muscolino and Cipriani in 2004, with the purpose of concentrating, the objectives of the exercises are to include stretching and contraction of abdominal muscles, respiratory muscles, conscious movements, motor coordination and strengthening of the upper and lower limbs with the aim of developing body understanding, improving self-esteem and quality of life.<sup>16</sup> The Pilates technique is divided into: exercises on the ground (with and without equipment: roller, Swiss ball, etc.) which are characterized by being educational behaviors, in other words, they focus on learning breathing and centralizing strength, in addition to contributing or hindering movements, in short, they can contribute to gaining stability of the spine, requiring more strengthening of the stabilizing muscles of the spine. Exercises with equipment (barrel, chair, reformer and cadillac) involve excellent performance of movements, all of them performed in a rhythmic, controlled manner, associated with breathing and postural correction.<sup>15</sup>

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movements, all of them performed in a rhythmic, controlled manner, associated with breathing and postural correction.<sup>15</sup>

A study conducted with an 11-year-old girl diagnosed with idiopathic scoliosis was promoted by the Physiotherapy sector of the Family Health Strategy Post II, in Uruguaiana, Rio Grande do Sul. Physiotherapy interventions, using the Pilates method, allowed improvements in the muscles around the spine, in addition to providing flexibility of the posterior muscular chain and strength of the flexor and extensor muscles of the trunk. Ten physiotherapy sessions were carried out, of which 4 weeks were held 3 times a week, lasting 1 hour each, with the first session being an evaluation session and the second one being a follow-up session. last reassessment.<sup>17</sup>

In the treatment of idiopathic scoliosis, this method has been favoring stability and reducing curvature, as well as postural alignment, this center of strength is composed of the stabilizing muscles of the spine and body dynamics, such as: abdominals, transverse abdominal, multifidus and pelvic floor muscles.<sup>18</sup>

#### 2.4 CONTRIBUTIONS OF METHODS AND EXERCISES AND THEIR IMPORTANCE FOR REDUCING SCOLIOTIC CURVATURE

Physiotherapy plays a very important role in the rehabilitation of patients with idiopathic scoliosis, since the goal is to prevent and/or reduce the increase in the Cobb angle and improve posture, giving the patient self-esteem and quality of life. From this point of view, we can find solutions in several physiotherapeutic interventions present in the literature and clinical practice, among them manual therapies: Global Postural Reeducation (RPG); Klapp Method; Myofascial Release; Pilates Method.<sup>19</sup>

It is a fact that physiotherapy, through different types of approaches and methods, has the main objective of reducing scoliotic curvature and preventing its progression. Before starting treatment, it is extremely important that during the evaluation of the anamnesis form, all information on the patient is collected. For example: misalignment of the shoulders; if the lumbar segment is shortening or stretching; if there is another pathology; if there is skeletal muscle dysfunction, etc. According to Leitão and Leitão (2006), it should be borne in mind

that physiotherapeutic conduct always respects all limitations, difficulties and pathologies, range of motion deficit, etc.<sup>20</sup>

In some cases, the correction of the spine to its normal position can be performed, thus only applying traction force to it, where the objective is to promote an increase in the space between the vertebrae, reducing the curvatures at the most critical points. Traction on the spine is an excellent strategy for aligning and straightening the spine without the need to handle or pick up the vertebrae and discs.<sup>21</sup> Through the radiographic analysis of patients with scoliosis who underwent procedures based on the RPG and Pilates methods, the use of active stretching, isotonic and isometric contractions was identified, which gave significantly positive results in reducing scoliotic curvature. Therefore, it is essential that more in-depth studies be carried out on this subject, using kinesiotherapy resources, with a greater number of patients for better comparison of the results.<sup>22</sup> If strengthening and stretching are not carefully and directed to the specific muscles needed, there will be no muscle balance, joint misalignment will continue to exist, causing pressure on the ligaments and tendons.<sup>5</sup>

## 2.5 THERAPEUTIC BENEFITS FOR STRENGTHENING AND RECOVERING THE SPINE STABILIZERS OF CHILDREN AND ADOLESCENTS

Marques points out that occasionally there has been a proven study that the RPG method brings beneficial results for reducing scoliosis, according to Toledo's studies, it was carried out in 20 schools, in a selection of students in the 10-year-old age range who underwent physiotherapy treatment through RPG, which demonstrated a considerably positive reduction. In the same way, another experiment was carried out on a 17-year-old girl, diagnosed with structural scoliosis. In total, there were 16 sessions, where there was a 10-degree reduction in the Cobb angle.<sup>12</sup> Pilates combined with low-impact exercises provides beneficial results for children and adolescents with idiopathic scoliosis, such as: reduced pain, gained muscle mass in tune with breathing, flexibility and stability. Above all, the method works the body together with strength, posture and motor coordination. The Pilates method works both on the floor and on equipment: Cadillac, Reformer, Chair and Barrel, with the aim of promoting activation of the



muscles around the spine.<sup>23</sup> To guide children in the treatment of idiopathic scoliosis, it is essential to bring playfulness, adapting exercises and stretches according to the child's age group, with this, the Pilates method enables the information that will support an improvement in posture, in addition to the child's exercise for the body development to which he/she is entitled. is inserted and, uniting all this with the act of playing.<sup>20</sup>

### 3 JUSTIFICATION

Adolescent Idiopathic Scoliosis (AIS) is a spinal pathology that must be treated preventively, as it is a complex deformity that prioritizes evaluation and treatment. This condition affects mostly females, as children and adolescents are generally healthy. This curvature is caused by the patient's sudden growth, occurring during puberty. The multiplicity of this musculoskeletal dysfunction comes from the three-dimensional deformity of the spinal column, thus causing deviation. lateral view of the spine in the coronal plane joined to the axial plane.<sup>24</sup> Some procedures and techniques physiotherapeutic, should be seen the most appropriate way for each patient.<sup>25</sup> For scoliosis have the objective of stimulating, making flexible and strengthening the segments of the spine, and these have been promoting positive results in adolescents with idiopathic scoliosis through the application of stretching in eccentric isotonic postures. Considering the relevance of this topic for future practices in the treatment of idiopathic scoliosis, it is essential to advance studies that refer to the adequate application of these procedures, so that these cases can be reduced.

### 4 MATERIAL AND METHOD

A systematic investigation was carried out through queries to search indexers in the Google Scholar, Repositório Universitário da Ânima (RUNA), SciELO and LILACS databases, covering projects published between January 2015 and March 2024. The search was carried out using the following keywords: scoliosis, definition of idiopathic scoliosis, children and adolescents, RPG method, pilates, kinesiotherapy, spinal pathology. The book Therapeutic Exercises: Fundamentals and Techniques by Kisner and Colby was selected to structure this review. Initially, 46 titles on the subject were found.

theme and, of these, 29 articles met the previously established inclusion criteria, addressing aspects of the treatment of idiopathic scoliosis for children and adolescents.

## 5 RESULTS AND DISCUSSIONS

The first case presented is by Tavares et al.<sup>28</sup> having as its name “Treatment for scoliosis by the global postural reeducation method (RPG) in totally visually impaired individuals: series of cases”. Highlight the benefits of the Method.<sup>12</sup> This research by Tavares et al.<sup>28</sup> To evaluate the amplitude of scoliosis in young adults with total visual impairment before and after physical therapy treatment using Global Postural Reeducation (RPG). The study by Tavares et al.<sup>28</sup> Six individuals with total visual impairment were selected, four males and two females. To participate in the study, patients must meet the following requirements:

a) age between 18 and 40 years, b) ability to stand without any assistance, c) having a diagnosis of visual impairment and the presence of gibbosity from the presented scoliosis. The following data were collected: weight, height and body mass index (BMI), and physiotherapy sessions were carried out once a week individually for a duration of 50 minutes over the course of 8 weeks.<sup>28</sup>

The Second and Third research highlighted is from authored by Febole et al<sup>26</sup> and Moura PM et al<sup>17</sup>, the second follows the theme 'Benefits of the Pilates Method in Patients with Alterations postural: Case study' and the third 'Effect of the Pilates Method on Idiopathic Scoliosis: Case Study'. The sample is a female patient, a 10-year-old student, whose body mass index and height were checked, an effective body anamnesis was performed and a body assessment form (IAP) was used, and the Visual Analogue Scale - EVA was used for pain.

The contemporary Pilates Method was applied for one hour a day, twice a day. week, the study showed that there was an improvement and reduction in postural dysfunctions.<sup>26</sup> The third case consists of a prospective study of an 11-year-old white female student diagnosed with idiopathic scoliosis. The study presented a physiotherapeutic evaluation, indicating Pilates Method exercises as a way of rehabilitating this postural dysfunction. The exercises applying the Pilates method (ground and accessories) were divided into three stages: Rolling down while standing, Stretching while lying down

dorsal, Stretching in prone position. Immediately after, there was an improvement in postural alignment of the upper and lower limbs, increased flexibility, and strength of the trunk flexor and extensor muscles.<sup>17</sup>

The following highlighted topics are authored by Santos et al.<sup>27</sup>, Pedrosa MN<sup>13</sup>, Samayedem CP et al<sup>12</sup>, Moreira LM et al.<sup>30</sup> Which has the names 'Effect of Reeducation' Global Postural Reeducation in the Treatment of Scoliosis during the Covid-19 Pandemic: Case Study', 'Global Postural Reeducation: Analysis of its effect on scoliosis in growing children and adolescents', 'Effect of Global Postural Reeducation therapy in the Treatment of adolescent idiopathic scoliosis: Case Study', 'Effects of Global Postural Reeducation (GPR) on thoracic hyperkyphosis: a case study'.

In turn, the study carried out by Santos et al. a female patient, a 16-year-old student, underwent three surgeries in 2017, 2018 and 2019 to place metal rods. However, in 2018, surgery was again performed to remove the rods due to complications, and in 2019 the rods were replaced. She followed the requirements and began treatment following the guidelines in the RPG method. a) Frog in the Air position, in which the patient would remain immobile without any assistance. The subclavicular and scalene release was performed with a maximum time of 20 minutes. b) Frog on the floor position, in which the patient was in dorsal decubitus on the RPG table, with chest opening, shoulders in abduction, forearm in supination and lower limbs in abduction. Shortly after evaluating, they realized that there were benefits from the first session of RPG treatment, a significant reduction in posture and a decrease in pain, even in the face of the COVID-19 pandemic.<sup>27</sup>

To obtain successful results, they were recruited individually and with signed consent, informing that they are aware of any procedure. In the selection for the study, female children diagnosed with idiopathic scoliosis in the thoracic region, aged 3 years with a Risser index at level four, according to (Ossification crossing the entire iliac wing, but not fused to the ilium) will have physiotherapy monitoring by a different professional. Once a week for 12 months. Subsequently, there was an analysis that found no significant differences in the reduction of the curvature.<sup>13</sup>The sample selection was carried out intentionally, among individuals aged 10 to 14 years (puberty period) with a clinical diagnosis of Idiopathic Scoliosis, proven by means of

X-ray imaging exams and following medical advice, seek physiotherapy treatment at the URI Erechim Physiotherapy School Clinic.

The physiotherapeutic approach consisted of a program of stretching, strengthening and postural awareness using the RPG method, twice a week for 8 weeks for a duration of 50 minutes. The results demonstrated a beneficial increase in the range of motion of the glenohumeral joint, reduction of the Cobb angle, and partial improvement in postural alignment. Thus, it is concluded that the RPG method proved to be effective in the treatment of adolescent idiopathic scoliosis.<sup>12</sup>

Eventually, even if it is not related to the pathology of scoliosis, Above all, it is important to highlight the extreme importance of the method in relation to other approaches. For example, a patient was chosen according to the following criteria: being in elementary school, being between 9 and 15 years old, presenting thoracic hyperkyphosis. The patient underwent 10 sessions, lasting one hour, with a one-week interval between sessions, and applying the RPG method, which is based on the following principle. The treatment was applied by a physiotherapist, with training and experience in the RPG method. During the method, two positions were applied: a) "lying on the floor with open arms" and "standing against the wall" for 4 series of 2 minutes and 30 seconds. They concluded that there were beneficial results of RPG in patients with thoracic hyperkyphosis in the acute phase. The treatment had 10 sessions, and there was also a decrease in pain.<sup>30</sup>

After the applicability of physiotherapeutic techniques, a study carried out by Paiva NLP et al<sup>23</sup>, Oliveira CM et al<sup>19</sup> and Hisamatsu MT et al<sup>29</sup> such as the following themes. 'Effect of Therapy Manual on the Treatment of Idiopathic Scoliosis in Adolescents: Case Report'. 'Physiotherapeutic treatment through kinesiotherapy in idiopathic scoliosis in adolescents: Case Report'. 'Group rehabilitation program in idiopathic scoliosis: case study'. Regarding the approaches adopted in the presented study, quasi-experimental, it had an academic objective of the orthopedic trauma internship; a 14-year-old girl diagnosed with idiopathic scoliosis was chosen, with an increase in the Cobb angle of 10°, using all methods such as klapp (Horizontal Sliding, lateral, large arc and large curve), myofascial release and RPG. After 22 physiotherapy sessions, there was a 3° increase in the Cobb Angle (with satisfactory progress) compared to the first contact.<sup>23</sup>

Another similar case is for authorship.<sup>19</sup> A 14-year-old white female patient with dorsolumbar scoliosis of idiopathic origin was stimulated with isometric and isotonic contractions of the abdominal, gluteal and concave-convex muscles to promote isometric contraction of the paravertebral muscles, in addition to self-growth, emphasizing the lengthening of the shortened muscle chains. The result was a reduction in the functional structures of the paravertebral muscles, and the final result was successful.<sup>19</sup>

The study was done by Hisamatsu MT et al<sup>29</sup>, There was a program in groups of individuals with idiopathic scoliosis, greater than 10° of the Cobb angle, between 10 and 24 years old (three women and two men), 23 sessions occurred in the period of 4 months. The participants were evaluated by the same evaluator through anthropometric measurements and x-ray examination and Cobb angle. Shortly following stretching exercises based on strengthening, proprioception and balance that were performed in all positions (dorsal, ventral and lateral decubitus, four supports, sitting and orthostatic position). The muscular strength exercises were associated with stabilization work, after the procedures during the 23 sessions beneficial results were verified for the scoliosis of the five patients: decrease in curvatures.<sup>29</sup>

Table 1: Studies found in the literature review

Author s/year	Type of Study	Features of the Sample	Types of Intervention	Main Variables Analyzed	Results Significant
Tavares GMS et al (2016)	Rehearsal clinical randomized (ECR)	They were selected intentionally subjects with deficiency total visual, with age between 18 40 years ago	The data radiological they were collected. Before and after eight sessions of RPG. The data were analyzed through the statistic descriptive and	In the first moment they were verified the data anthropometric: weight, height and (BMI). No second moment were carried out the services	In the present study, the method of RPG, after eight sessions, no changed the curve scoliosis of the six individuals with disability total visual. In the however, in the

			test of Student for sample paired.	by the method RPG. With time previously marked and duration of 50 minutes to one time for one period of eight weeks.	most of the individuals (four among the six) there was reduction in value of angle of Cobb.
Febole SF et al (2022)	Study of case	A patient of the female, 10 years of age.	For the intervention, they were carried out exercises of the method Pilates contemporary and, a hour by day, two times in week, during 12 weeks, totaling 24 sessions.	It was carried out an anamnesis fast body using a record of instrument of assessment body (IAP) and the Scale Visual Analog – EVA for pain.	It was carried out again the assessment body for the comparison of results obtained, being observed improvement in alignment postural of patient, There was also improve in your amplitude of movement (ADM), force muscular and mobility.
Moura of PM and al (2015)	Study of case	A teenager of 11 years of age, white, with diagnosis clinical of scoliosis idiopathic.	included: exercises of the method Pilates solo and accessories, consisting of 10 sessions, three times by week, during a month.	They were used exercises specific to Pilates solo (Swiss ball and half ball or bosu), being a series of 10 repetitions for each exercise.	After the intervention, presented improve postural in the alignment. The flexibility and the strength of the muscles flexors and extenders of stem
Saints	Study	The individual of	Submitted	Technique,	The Acute Effect

DC et al (2021)	of Case	female, white color, student, 16 years, with diagnosis of scoliosis,	initially to the questionnaire effects of pandemic of the COVID-19, soon after, the questionnaires from Corlett, Manenica and (EVA). and photogrammetry before and after the treatment of a session of RPG by one hour.	stretching the muscles shortened, in these cases use a technique that aims lengthen the muscles anti-gravitational, lasting for approximately you 15 to 20 minutes, in each posture.	provoked for the treatment of RPG in a single session brought improvements visible of the posture, quantified at angles and decrease in pain, even before the pandemic of the COVID-19.
Pedrosa PM (2021)	Rehearsal clinical randomized (ECR)	The sample was composed of eight individuals, of the genre feminine.	The effects they were evaluated put comparison from the angle of cobb and Index from Risser, pre measured and post treatment, put through an x-ray in load.	After analysis statistics no they were found different meanings in the angle of the curvature of the scoliosis.	It seems not exist a positive effect in the decrease from the angle of scoliosis when analyzed in group, being necessary more studies to analyze that effect.
Samaye from PC and al (2016)	Study of case, almost experience mental, description you, of type intervene	Between individuals with diagnosis clinical of Scoliosis Idiopathic. Proven by means of examinations of images (Ray	The treatment proposed was carried out with two sessions weekly, for eight weeks.	Proposes the realization of active postures, based on the knowledge of the chains muscular, the realization of exercises concentric	This form, it is concluded that the method of RPG showed- if effective in treatment of scoliosis idiopathic adolescent.

	<p>ntion, with addresses gem qual- quantity active.</p>	<p>X), aged between 10 and 14 years (period related to puberty and at the stretch of growth).</p>		<p>for the muscles of the dynamics and eccentrics for the muscles of the static.</p>	
<p>Moreira LM et al (2017)</p>	<p>Study of Case</p>	<p>The patient of the female, with 14 years of age, 43 kg body mass, 1.65 m tall height, 15.8 kg/ m<sup>2</sup> of BMI.</p>	<p>The patient he was submitted to 10 sessions of an hour of the RPG method.</p>	<p>The sessions they were composed of two postures: “frog in the floor of arms open” and posture “standing against the wall”. The data were collected with the instrument flexicurve before the start of the treatment (pre-test), before and after each session and a week after the last session of treatment (post-test).</p>	<p>It is concluded that the RPG presented acute effect of reduction of hyperkyphosis thoracic in the case studied, after each session of treatment and after 10 weeks of intervention.</p>
<p>Paiva NLP of and al (2024)</p>	<p>Study of case.</p>	<p>A patient of 14 years old presenting the diagnosis of scoliosis idiopathic.</p>	<p>It was done and traced conducts of intervention based on RPG, Method of Klapp and Therapy Manual during 22 service, being two</p>	<p>It was carried out assessment physiotherapy postural by middle of positioning symmetrograph, Test of adams and analysis radiographic.</p>	<p>Presented a increase of 3rd degrees of Cobb angle and as regards to the changes of language bodily, no there was difference considerable. The result was considered</p>



			times in week with duration of 50 minutes.		satisfactory, validating the performance and the relevance of physiotherapy in front of the case evaluated.
Oliveira CM et al (2015)	Study of case.	An individual of the male, fourteen years old, white color, resident in Ilha Single, where was carried out treatment described in this work, carrier of scoliosis in "S" dorsolumbar, of origin idiopathic. In the physical examination, was observed asymmetry of trunk and pelvis.	The treatment kinesiotherapy the through the exercises proposed, which consisted in auto stretching and strengthening of the muscles of the column vertebral. The adolescent was submitted to the process of treatment for the period of 22 months, performing the exercises proposed twice per week with sessions of duration of 60 minutes.	Assessment radiographic initial determining scoliosis in "S".	demonstrated that the kinesiotherapy (Pilates, RPG R Klapp) by middle of the stretching assets, contractions isotonic and isometric that reached the musculature paravertebral could contribute significantly nte for the reduction of curvature scoliotic.
Hisamatsu MT et al (2017)	Rehearsal clinical randomized (ECR)	Participation five individuals with scoliosis idiopathic, of both genres (three women and two men), with age	The patients carried out, on average, 23 sessions of exercise in group and the measure of angle of Cobb was	The program of rehabilitation of deviations postural is constituted of activity group physics associating, stretching,	We can conclude that there was a reduction of the degree of scoliosis in all cases, independent of age, of gender and

		between 10 and 28 years.	carried out, by the same examiner, before and after the period of intervention. And they carried out in average 23 sessions (minimum of 16 and maximum of 29 sessions) in a period of 4 months of intervention.	balance, strengthening and conscience body.	number of sessions carried out, but the assiduity was considered a factor important in rehabilitation.
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Source: Organized by the author (2024)

Scoliosis, a pathological curvature of the spine, is a condition that affects children and adolescents, mainly girls, with significant intensity, as it can cause negative impacts on the physical and psychological health and quality of life of children and adolescents. According to the context, the use of non-invasive therapeutic methods such as Global Postural Reeducation (RPG) and Pilates have been indicated as approaches for rehabilitation and postural correction in pediatric patients with scoliosis.

The RPG method, developed by Philippe Souchart, is more focused on passive and active postural correction, with an emphasis on stretching and rebalancing the muscle chains, which address the muscles in an integrated manner, allowing the body to find a balanced and functional posture. While Pilates focuses on strength and muscle control through dynamic and functional exercises, created by Joseph Pilates, it focuses on muscle strengthening, movement control and body awareness, and breathing. Both methods share the principle of improving postural alignment, mobility and strength, fundamental characteristics for the treatment of scoliosis.

## 5.1 COMPARISON BETWEEN RPG AND PILATES

While RPG may be more effective in the initial phase of treatment, helping to reduce scoliotic curvature, muscle tension and improve mobility, Pilates may be more suitable in subsequent stages, thus focusing on maintaining corrected posture and strengthening stabilizing muscles.

It is important to highlight that RPG is usually applied in individualized sessions, where the physiotherapist can adjust the patient's positions in detail, stretching according to the patient's specific condition. Similarly, Pilates, in turn, can be performed both individually and in small groups, which makes it more accessible and practical in terms of adherence to long-term treatment.

## FINAL CONSIDERATIONS

Therefore, the literature review allows us to conclude that idiopathic scoliosis can occur in children and adolescents, but mainly in girls. Furthermore, the causes for this type of occurrence (idiopathic) remain unknown, however, with physiotherapy monitoring and techniques and methods (RPG, Pilates) they prove to be efficient, with regard to the types of curvatures, as there is a significant reduction in the curvature angles. of scoliosis.<sup>25</sup>

More case studies and clinical trials related to the topic are needed to evaluate the long-term beneficial effect of RPG and Pilates in different degrees of scoliosis and age groups, in addition to investigating the best way to combine these methods with other physiotherapeutic approaches, such as the use of braces and traditional physiotherapy. However, the results obtained indicate that these methods should be considered as viable options in the treatment of scoliosis, providing a safe and adaptable approach for postural rehabilitation in scoliotic patients.

## BIBLIOGRAPHICAL REFERENCES

1. Gonçalves S dos S, Veneziano LSN. The role of physical therapy in idiopathic scoliosis in children and adolescents. Rease [Internet]. 2022 May 31 [cited 2024 April 4];8(5):1169-78. Available from: <https://periodicorease.pro.br/rease/article/view/5462>
2. Silva HB. Comparison of isostretching and conventional kinesiotherapy methods in the treatment of scoliosis [Internet Course Conclusion Work]. Tubarão: Universidade do Sul de Santa Catarina; 2020 [cited on 28 Mar 2024]. 36 p. Available at: <https://repositorio.animaeducacao.com.br/bitstreams/8ad7fed1-dba6-422d-a5a9-f891bb648b3d/download> Bachelor in Physiotherapy.
3. Freitas MGS, Medeiros SML, Câmara GLG. Physiotherapeutic resources for postural deviations of the spine: an integrative review. Rev Pesq Fisio[Internet]. 2020 May 15 [cited 2024 Mar 31];10(2):355-64. Available at: <https://www5.bahiana.edu.br/index.php/fisioterapia/article/view/2829>
4. Borges ACAS, Souza TP de, Rodrigues GMDM, Monteiro EM de O, Assunção ERde S, Souza RAG de. Physiotherapeutic treatment for adolescents with idiopathic scoliosis. Braz. J. Hea. Rev. [Internet]. 2018 Dec. 27 [cited 2024 Apr 1];2(1):453-60. Available from: <https://ojs.brazilianjournals.com.br/ojs/index.php/BJHR/article/view/1023>
5. NEUMANN JV, Luz VS. Types of physical exercises and postural deviation in adolescents: a literature review [Course Conclusion Work on the Internet]. Joinville, SC: SOCIEDADE EDUCACIONAL SANTA CATARINA – UNISOCIESC; 2021 [cited on April 1, 2024]. 26p. Available at: <https://repositorio.animaeducacao.com.br/bitstreams/cdc851a0-00f2-48cc-b261-44b97f47e0e7/download> Undergraduate Course in Bachelor's Degree in Physical Education.
6. Ferreira DG. Adolescent Idiopathic Scoliosis [Dissertation on the Internet]. Covilhã: University of Beira Interior Health Sciences; 2015 [cited 2024 Mar 21]. Available at:

<https://www.proquest.com/openview/dc57569764b0fd0d033de196d4b7e18e/1?pqorigsite=gscholar&cbl=2026366&diss=y> Master of Medicine Degree.

7. Santos IR. Quality of Life of Adolescents with Idiopathic Scoliosis: contributions of physiotherapy. *anima education repository* [Internet]. 2021 Dec 1 [cited 2024 Apr 2]; Available at: <https://repositorio.animaeducacao.com.br/handle/ANIMA/17865>

8. Mesquita AM. Physiotherapy as a conservative treatment method for scoliosis in adolescents [Course Conclusion Work]. São Luís- MA: Faculdade Pitágoras; 2022 [cited April 2, 2024]. Available at: [https://repositorio.pgsscogna.com.br/bitstream/123456789/51665/1/ANDREINA\\_MORAIS\\_MESQUITA.pdf](https://repositorio.pgsscogna.com.br/bitstream/123456789/51665/1/ANDREINA_MORAIS_MESQUITA.pdf) Degree in Physiotherapy.

9. Marchetti BV, Raupp E, Sedrez JA, Ribeiro RP, Candotti CT. Importance of clinical experience for measuring the scoliotic curve of children using the Cobb technique. *Physiotherapy and Research* [Internet]. 2019 Sep;26(3):241–6. Available at: <https://www.scielo.br/j/fp/a/ttwXhRF3sVxjmlL7WtkBvjvy/?format=pdf&lang=pt>

10. Santos Amg Dos, Leal S De S, Pereira Rgb. The Benefits of RPG (Global Postural Reeducation) in Juvenile Idiopathic Scoliosis. *Rmnm* [Internet]. July 25, 2023 [cited April 13, 2024];5(1). Available At: <https://Revista.Unipacto.Com.Br/Index.Php/Multidisciplinar/Article/View/1308>

11. Boubekour V, Amaral PDL, Analysis of the effectiveness of the Schroth and Pilates methods in reducing the Cobb angle in adolescent idiopathic scoliosis: Literature review. [internet]. [May,2021].1- 15. Available at: [https://bdigital.ufp.pt/bitstream/10284/10194/1/PG\\_38957.pdf](https://bdigital.ufp.pt/bitstream/10284/10194/1/PG_38957.pdf)

12. Samoyedem CP, Ferla BM, Comerlato T. Effects of global postural reeducation (GPR) technique in the treatment of adolescent idiopathic scoliosis–Case study. See *Perspective* [Internet]. 2018 [cited 2024 Mar 21];42(Special Issue):23-34. Available from:

[https://www.uricer.edu.br/site/pdfs/perspectiva/1005\\_656.pdf](https://www.uricer.edu.br/site/pdfs/perspectiva/1005_656.pdf)

13. Pedrosa MN. Postural reeducation: analysis of its effect on scoliosis in children and adolescents in the growth phase [Internet]. recipp.ipp.pt. 2021 [cited 2 April 2024]. Available at: <http://hdl.handle.net/10400.22/19739>

14. Rocha PAC da. Effectiveness of the RPG method on postural changes in healthy individuals. b digital ufp [Internet]. 2015; Available at: <http://hdl.handle.net/10284/4856>

15. Vasconcelos FS de OR. The use of the Pilates method in the treatment of idiopathic scoliosis with small degrees of curvature: a literary review. Div Journ [Internet]. 2019 Sep 29 [cited 2024 Apr 13];4(3):800-9. Available at: [https://diversitas.emnuvens.com.br/diversitas\\_journal/article/view/916](https://diversitas.emnuvens.com.br/diversitas_journal/article/view/916)

16. Sette RBT, Xavier EL, Gomes TK da S, Raimundo RD. Pilates for children: a fun way of postural education. Temas em Saúde [Internet]. 2019 [cited 2024 Mar 20];19(1):132-148. Available at: <https://temasemsaude.com/wpcontent/uploads/2019/01/19109.pdf>

17. Miotti de Moura P, Luz da Silva M, Pinto Teixeira L, Ferreira Yamada E, Lara S. Effect of the Pilates method on idiopathic scoliosis: a case study. Sci Med [Internet]. 2015 Jan 27 [cited 2024 Apr 1];24(4):391- 8. Available from: <https://revistaseletronicas.pucrs.br/index.php/scientiamedica/article/view/18253>

18. Montanez, D. R; Lara, S. The influence of the Pilates method on children's motor development. R. bras. Ci. and Mov 2015;23(4): 64-71. available at: <https://portalrevistas.ucb.br/index.php/RBCM/article/view/5469>

19.. Oliveira CM de, Teixeira GMR, Cubo RCP. Physiotherapeutic treatment through kinesiotherapy in adolescent idiopathic scoliosis: case report. Unifunec Cient. Mult. [Internet]. 2015 Aug 25 [cited 2024 Apr 4];3(5):122-30. Available at:

<https://seer.unifunec.edu.br/index.php/rfc/article/view/1585>

20. Petrini AC, Venceslau AC, de Oliveira LG, Colombo S de JM. PHYSIOTHERAPY AS A CONSERVATIVE TREATMENT METHOD IN SCOLIOSIS: A REVIEW. Rev Cient Fac Educ e Meio Ambient [Internet]. 2015 Dec 16 [cited 2024 Apr 3];6(2):17-35. Available at: <https://revista.unifaema.edu.br/index.php/Revista-FAEMA/article/view/308>

21. Farias DL. Importance of Postural Prevention in Childhood and Adolescence. [Internet]. [2021];13-28. Available at: [https://Repositorio.Pgsscogna.Com.Br/Bitstream/123456789/36374/1/Daniela\\_lemos\\_farias.Pdf](https://Repositorio.Pgsscogna.Com.Br/Bitstream/123456789/36374/1/Daniela_lemos_farias.Pdf)

22. Reis LL. Biomechanical Study of the Spine with Adolescent Idiopathic Scoliosis [Master's Dissertation Online]. U.Porto Repository: FEUP - Faculty of Engineering of Porto; 2015 [cited on 25 Mar 2024]; (145). Available at: [https://sigarra.up.pt/fep/pt/pub\\_geral.show\\_file?pi\\_doc\\_id=30949](https://sigarra.up.pt/fep/pt/pub_geral.show_file?pi_doc_id=30949) Master in Biomedical Engineering.

23. Paiva NLP, Castro A, Reis SS, Gomes ES, Fusco GVB. The effects of manual therapy in the treatment of idiopathic scoliosis in adolescence: case report. Rev Saúde Mult. 2023 [cited on April 4, 2024];14(1):85–9. Available: <http://revistas.famp.edu.br/revistasaudemultidisciplinar/article/view/609>

24. Rodrigues ES, Oliveira D da S, Sena ELA de, Azevedo KF, Pires TPP, Vallejo NM. The Klapp Method and its therapeutic efficacy in spinal dysfunctions. Rondônia Research Forum [Internet]. 2022 [cited 2024 Apr 1];3(8th). Available at: <https://jiparana.emnuvens.com.br/foruns/article/view/630/561>

25. Carvalho JAC, Oliveira KBG, Fontes L dos S, Matos LS, Batista PNS, Carvalho SRC. Preventive Guide for Scoliosis in Young People. [Online magazine]. [Paripiranga-BA 2021]. [5 - 12]. Available at: <https://repositorio.animaeducacao.com.br/items/7347d606-c14b-443b-9a40-a5e8b806ed10>

26. de Souza FEBOLE F, Papani SCALCO L, Zezi SANCHES B. BENEFITS OF THE PILATES METHOD IN PATIENTS WITH POSTURAL CHANGES: CASE STUDY. Rev Cient Unilago. Jan 14, 2022:11.

27. Castriani Santos D, Ribeiro Malacrida L, Bruno Mariano T. EFFECT OF GLOBAL POSTURAL REEDUCATION IN THE TREATMENT OF SCOLIOSIS DURING THE COVID-19 PANDEMIC: CASE REPORT. repositorio. 2021;8(79 - 87):<http://www.repositorio.ufc.br/handle/riufc/63552>.

28. Tavares GMS, do Espírito Santo CC, Parizotto P, Sperandio FF, Santos GM. Treatment for scoliosis by the global postural reeducation (RPG) method in totally visually impaired individuals: case series. Sci Med [Internet]. 2016 Jan 26 [cited 2024 Oct 19];25(3):ID21172. Available in: <https://revistaseletronicas.pucrs.br/scientiamedica/article/view/21172>

29. Mayumi Hisamatsu T, Puzzi Ladvig R, Pereira Veronese T, Minonroze Albuquerque Ferreira D. GROUP REHABILITATION PROGRAM IN IDIOPATHIC SCOLIOSIS: CASE STUDY. Unoeste. 13 Jan 2017: <https://journal.unoeste.br/index.php/cv/article/view/1665>.

30. Machado Moreira L, Adami Sedrez J, Noll M, Tarragô Candott C. EFFECTS OF GLOBAL POSTURAL REEDUCATION (RPG) ON THORACIC HYPERKYPHOSIS: A CASE STUDY. ArqCienc. May 2017;21(2): [https://www.researchgate.net/profile/Matias-](https://www.researchgate.net/profile/Matias-Noll/publication/319891654_EFFECTS_OF_GLOBAL_RPG_POSTURAL_REEDUCATION_ON_A)

[Noll/publication/319891654\\_EFFECTS\\_OF\\_GLOBAL\\_RPG\\_POSTURAL\\_REEDUCATION\\_ON\\_A](https://www.researchgate.net/profile/Matias-Noll/publication/319891654_EFFECTS_OF_GLOBAL_RPG_POSTURAL_REEDUCATION_ON_A).



