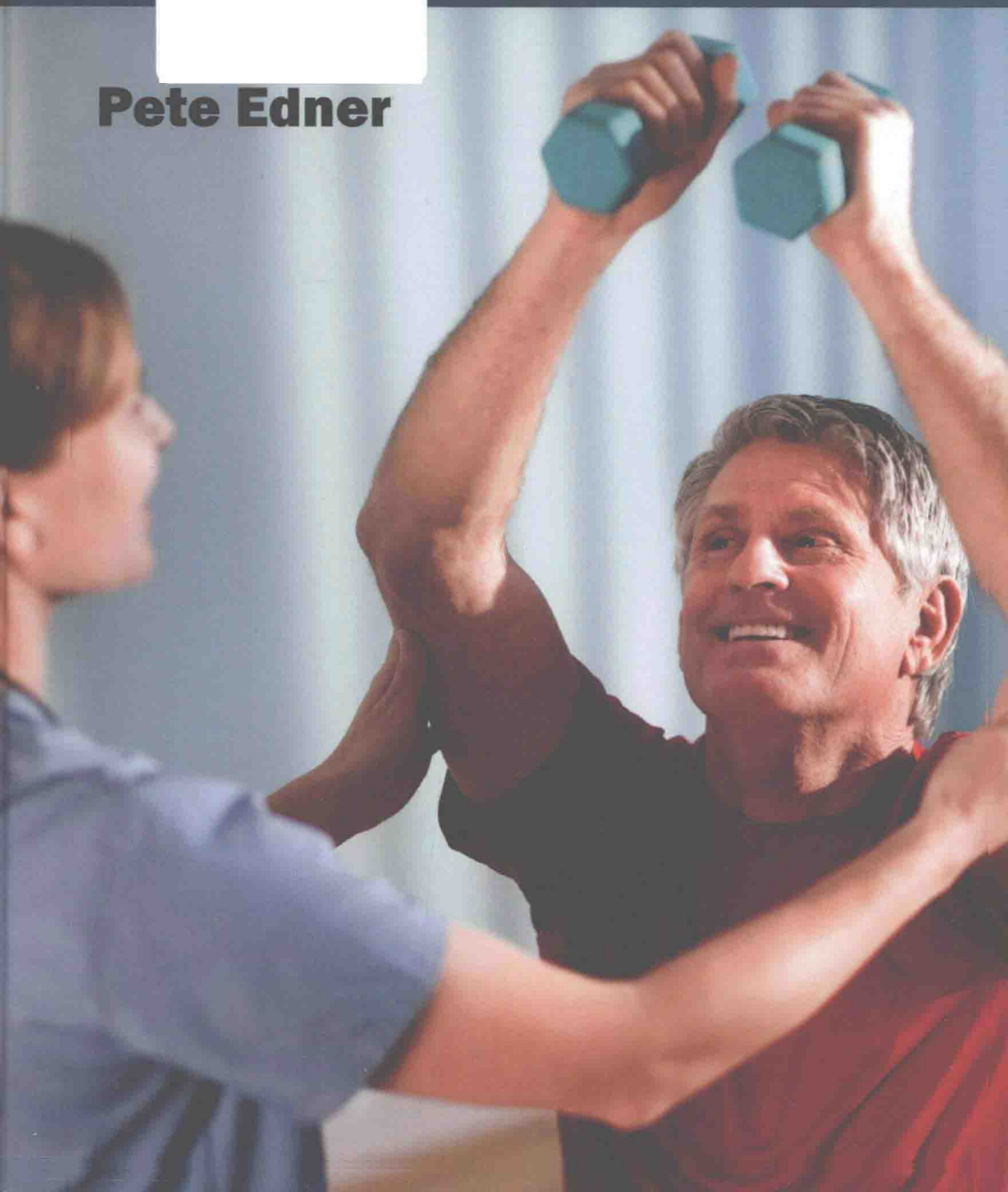
New Frontiers in Physical Therapy

Pete Edner



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Edited by **Pete Edner**

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Preface

This book was inspired by the evolution of our times; to answer the curiosity of inquisitive minds. Many developments have occurred across the globe in the recent past which has transformed the progress in the field.

Physical therapy or physiotherapy holds a position of great importance in various medical fields both as a primary as well as an assistive practice. This book has been compiled of novel information on physical therapy research and clinical approaches that are being undertaken in several medical conditions. Specific and specialist exercises for the treatment of scoliosis and spinal deformities in infants as well as adolescents; biomechanical and musculoskeletal conditions as well as the impact of psychological factors, body awareness and relaxation methodologies; novel thermal agents; and various types of physical therapy interventions have been introduced for the aged both in clinical as well as domestic setups. Furthermore, research on physical therapy interventions for patients suffering from cardiovascular, respiratory disorders and stroke currently being carried out and novel concepts of wheelchair design being put to use have been presented in the book.

This book was developed from a mere concept to drafts to chapters and finally compiled together as a complete text to benefit the readers across all nations. To ensure the quality of the content we instilled two significant steps in our procedure. The first was to appoint an editorial team that would verify the data and statistics provided in the book and also select the most appropriate and valuable contributions from the plentiful contributions we received from authors worldwide. The next step was to appoint an expert of the topic as the Editor-in-Chief, who would head the project and finally make the necessary amendments and modifications to make the text reader-friendly. I was then commissioned to examine all the material to present the topics in the most comprehensible and productive format.

I would like to take this opportunity to thank all the contributing authors who were supportive enough to contribute their time and knowledge to this project. I also wish to convey my regards to my family who have been extremely supportive during the entire project.

Editor

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Part 1

Physical Therapy for Scoliosis and Spinal Deformities in Infants, Adolescents and Adults

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A Review of Non-Invasive Treatment Interventions for Spinal Deformities

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1. Introduction

Spinal deformities of the scoliotic type, affect approximately 2% of the population.[1] When an individual has an s-shaped curve of greater than 20 degrees, treatment is usually indicated. For curves that are not (severe is defined as greater than 45 degrees; requiring surgery) various physical therapy treatment interventions are often tried. These include Electrical muscle stimulation, bracing, exercise programs, and manipulation. All of these interventions are considered conservative treatments that have been commonly used to treat scoliosis.[2-4] The impact of various interventions has been scrutinized in the literature, and their outcomes have been found to have variable levels of effectiveness.[3] In addition to the physical impact of scoliosis, the emotional impact of scoliosis must also be addressed since having scoliosis will often dramatically affect a patient's self-image, which in turn can impact their perceived pain levels. Ultimately, scoliosis can result in a number of secondary impairments, which if left untreated, can be severe.[5,6]

A new conservative treatment device for scoliosis that has recently been written about in the literature is the ATM2™ (active therapeutic movements version 2).[7] The ATM2™ is a vertical treatment table; a concept that was developed by a physical therapist trained in "Mulligan Techniques" (Mobilization with Movement).[8] Clinical evidence has been documented for the efficacy of the ATM2™ when used with patients who have types and causes low back pain, hip problems, shoulder problems and cervical problems. The ATM2™ was found to be effective in helping to reverse the curves in a patient with scoliosis who was actually being treated for a frozen shoulder in a recently published case study.[7] Since this publication, continued study has been undertaken to determine if the ATM2™ is effective in treating mild to moderate scoliosis, particularly its effectiveness in reversing the curves of subjects with scoliosis.

This chapter will review traditional non-invasive physical therapy interventions for scoliosis. It will discuss the effectiveness or lack thereof of exercises, manipulation, bracing, and electrical stimulation. It will introduce the ATM2™ as a new intervention for mild to moderate scoliosis and discuss published research thus far along with ongoing research currently being conducted.

2. Background: Types, causes and diagnosis of scoliosis

2.1 Definition of scoliosis

Scoliosis is used to describe an abnormal curvature of the spine, but it is not in itself a disease or a diagnosis. The curvature of the spine from scoliosis is easily seen as a deviation on the frontal plane and may develop as a single curve (shaped like the letter C) or as two curves (shaped like the letter S).

2.2 Types and causes of scoliosis

Scoliosis usually develops in the upper back (thoracic spine) or area between the upper back and lower back (the thoracolumbar area of the spine). It may also occur only in the lower back (lumbar spine). Scoliosis can be caused by congenital, developmental or degenerative problems, but most cases of scoliosis have no known cause, and are considered to be idiopathic scoliosis. While there are many forms of scoliosis, four of the most common ones include:

- Congenital scoliosis. This is a relatively rare form of congenital malformation of the spine. Patients with congenital scoliosis will often develop scoliotic deformities in their infancy.
- Neuromuscular scoliosis. This may occur when the spine curves laterally due to weakness of the spinal muscles or from other neurologic problems. This form of scoliosis is especially common for individuals who cannot walk due to their underlying neuromuscular condition and are confined to a wheelchair for locomotion (such as muscular dystrophy or cerebral palsy). This may also be called *myopathic scoliosis*.
- Degenerative scoliosis. Scoliosis can also develop later in life, as joints in the spine degenerate and the intervertebral discs lose height, leading to a bending in the back. This condition is sometimes called *adult scoliosis*.
- Idiopathic scoliosis. By far the most common form of scoliosis is idiopathic scoliosis, which most often develops in adolescents and typically progresses during the adolescent growth spurt. Because it most often occurs during adolescence, this condition is sometimes called *adolescent scoliosis*.

Fig. 1. Idiopathic Scoliosis

Idiopathic scoliosis occurs to some degree in approximately one half million adolescents in the US. There is no known cause of idiopathic scoliosis although it does tend to occur in families.

Idiopathic scoliosis is usually categorized into three age groups:

- From birth to 3 years old - called *infantile scoliosis*
- From 3 to 9 years old - called *juvenile scoliosis.*
- From 10 to 18 years old – called *adolescent scoliosis.*

This last category of scoliosis, which occurs from 10 to 18 years old, comprises approximately 80 percent of all cases of idiopathic scoliosis.

The risk of curvature progression is increased during puberty, when the growth rate of the body is the fastest. Scoliosis with significant curvature of the spine is much more prevalent in girls than in boys, and girls are eight times more likely to need treatment for scoliosis because they tend to have curves that are much more likely to progress. Still, the majority of all cases of scoliosis are mild and do not require treatment.

It is important to note that idiopathic scoliosis results in spinal deformity, and is not typically a cause of back pain. Of course, people with scoliosis can develop back pain, just as most of the adult population can. However, it has never been found that people with idiopathic scoliosis are any more likely to develop back pain than the rest of the population.[9-11]

In children and teenagers, scoliosis often does not have any noticeable symptoms and scoliosis is often not noticeable until the curve has progressed significantly.

Scoliosis does not come from any types of sports involvement, the use of backpacks, sleeping positions, posture, or minor leg length differences.

When viewed from the side (in the sagittal plane), a healthy spine curves inward in the lower back (lordosis) and outward in the upper back (kyphosis). When viewed from the back (posteriorly), a spine with normal curves appears as a straight line down the back. A person with scoliosis however, will appear to have a lateral curve in their spine.

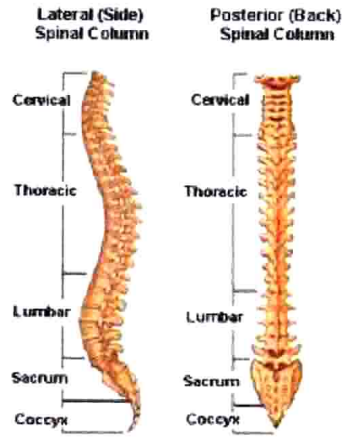

Fig. 2. Normal Spine

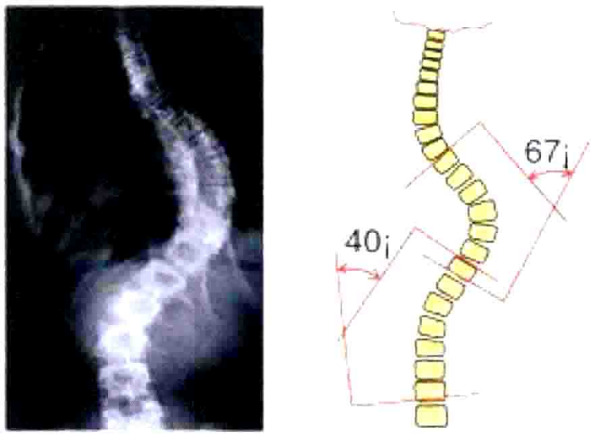

Fig. 3. Spine with Scoliosis

There are several common physical symptoms that may indicate scoliosis. Typically, symptoms of scoliosis may include one or several of the following:

- One shoulder is higher than the other
- One shoulder blade protrudes further than the other
- One side of the rib cage appears higher than the other
- One hip appears higher or more prominent than the other
- The waist appears uneven
- The body tilts to one side
- One leg may appear shorter than the other

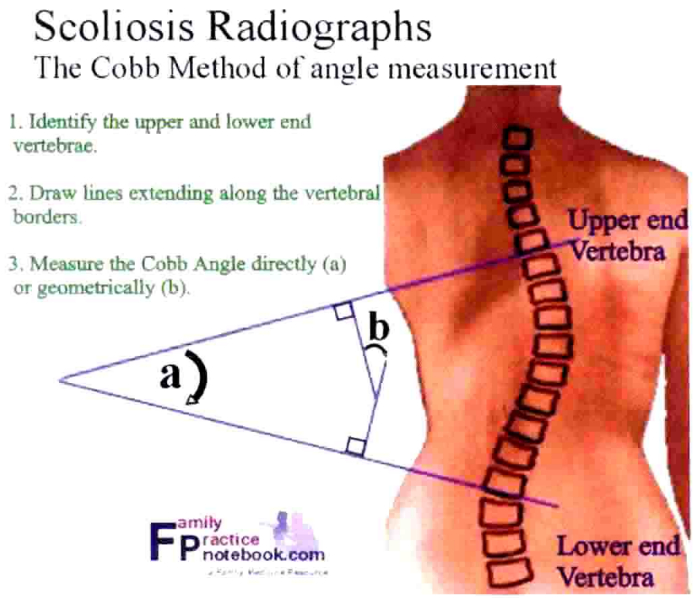

Fig. 4. Cobb Angle