

Schroth's Textbook of Scoliosis and Other Spinal Deformities

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Edited by

Marc Moramarco, Maksym Borysov,
Shu Yan Ng and Hans-Rudolf Weiss

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and Hans-Rudolf Weiss

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PREFACE

Although the Schroth method has been in existence since 1921, it has only recently spread beyond the borders of Germany. During this time, I have been fortunate to have had the opportunity to introduce the method and its newest developments to the United States. It is now my honor to serve as co-author and editor to this first edition of Schroth's Textbook of Scoliosis and Other Spinal Deformities. In doing so, I have collaborated with many of the finest conservative scoliosis practitioners and researchers from around the world, each of whom shares my vision to improve the lives of children and adults with scoliosis.

The contributors to this text are a diverse group and include orthopedic surgeons, chiropractors, physiatrists, occupational therapists, physical therapists, researchers, scientists, professors, and orthotists. All are trailblazers who recognized the need for this treatment without hesitating to challenge the status quo. Like me, many are full-time practitioners dedicated to delivering the highest quality patient care. Treating scoliosis requires passion and commitment. Contributing to a text like this is no small task. I appreciate the extra hours each practitioner has dedicated to this book, much of it done late into the night or in the early morning hours.

My passion for conservative scoliosis treatment began when I diagnosed my own daughter with adolescent idiopathic scoliosis in January 2001. It was the beginning of a long journey searching for the most effective treatment options. In a sense, my work on this book is something of a "full circle" experience because I began my search reading *Moe's Textbook on Scoliosis and Spinal Deformities*, a preeminent work on the subject. While that book is an excellent resource, its focus on surgery didn't match my vision for my child's scoliosis treatment.

Fortunately, not everyone shares the philosophy that surgery is the only solution for treating severe scoliosis. To that end, I am indebted to many people. Dr. John Triano, a former professor and researcher from my chiropractic college, is probably unaware of his impact on my family's story, and in turn, the story of others – both patients and practitioners. During my intensive, year-long search for an alternative, everyone I contacted denied the existence of any way to treat scoliosis other than surgery. Discouraged and nearly defeated with few places left to turn, one day it dawned on me to track down Dr. Triano. After listening to my

predicament, he directed me, to “go to Germany.” It was the first time anyone had mentioned the existence of any type of exercise rehabilitation. My next call was to the Schroth clinic. The person who answered the phone did not speak English but fortunately connected me to Dr. Hans-Rudolf Weiss, grandson of the method's creator - Katharina Schroth. Dr. Weiss invited me to visit to learn more. The Schroth method became a light at the end of a long, dark tunnel.

After traveling to Germany and learning what needed to be done we returned home to apply what we learned. Over time, I began to witness my daughter's improvement firsthand! My wife and I were relieved but questioned why more physicians in our country (the US) either didn't know about the Schroth method or didn't inform patients of its potential benefits.

I wanted to know more. I continued regular communications with Dr. Weiss and returned to Germany several times. Our close relationship has allowed me to elevate my knowledge in ways that would have never been possible otherwise. It positioned me to be on the frontlines during the developmental phases of Schroth Best Practice and the Gensingen Brace. I am truly grateful to Dr. Weiss for his willingness to share his unmatched knowledge and for the pivotal role he played in enabling me to help my daughter and others.

Martha C. Hawes was another important individual offering her friendship and guidance in the early days. In the fall of 2002, I flew to Arizona to meet with her. While there, she presented me with the first copy of her newly published text, *Scoliosis and the Human Spine*. It forever changed the way I view scoliosis treatment. She will always have my immense respect and gratitude.

My unique training in Schroth principles is unlike that of anyone else practicing today. My initial introduction (Germany, 2002) was with Udo Roevenich, a senior Schroth therapist. Motivated to advance my knowledge, I attended the first US Schroth course taught by Dr. Manuel Rigo of Spain in 2004. Despite my extensive hands-on training, I was eager to officially gain Schroth certification.

In May 2007, we hosted Dr. Weiss in our home for dinner while he was attending the SOSORT meeting in Boston. My wife served a fantastic lobster meal and I appealed to him to offer the first certification course for international practitioners. He agreed! That July, I became the first American to be certified, in Germany, alongside Deborah Turnbull of the UK. We were trained by Axel Hennes, senior physical therapist at the Asklepios Katharina Schroth Clinic where Dr. Weiss served as the medical director. I also began to communicate regularly with Christa Lehnert-

Schroth, author of *Three-Dimensional Treatment for Scoliosis*. Learning directly from her – on a few occasions in her own home in Bad Sobernheim – was inspirational! As new Schroth developments evolved, I went on to attain Schroth Best Practice certification as well (both basic and advanced) with Dr. Weiss.

With respect to bracing, I've had the advantage of training directly with Dr. Weiss alongside his orthotists. I have also had the good fortune to learn from Maksym Borysov, a Schroth Best Practice Academy board colleague. His knowledge of Schroth principles and Chêneau bracing are of the highest caliber. Along the way, he has become a close friend whose insights have been invaluable.

As this text was being prepared for print, a former co-worker stopped in to see me. While in the office she inquired about recent developments regarding my work with scoliosis. She joked, "Do you remember when everyone thought you were crazy?" Her comment reminded me of one of my favorite quotes by German philosopher Arthur Schopenhauer which states, "All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident."

In your region of the world, acceptance of the Schroth method may be at any one of those phases. The purpose of this book is to disseminate knowledge about the tremendous impact that Schroth method exercise and bracing can provide for patients with spinal deformities (including scoliosis and kyphosis). For practitioners, specific information is provided regarding patient assessment, evaluation and treatment indications as well as general information regarding imaging studies, the natural history of spinal deformities, and the etiological theories of scoliosis. When the presentation of scoliosis is atypical, one must consider that it may not be idiopathic. For that reason, we also include chapters on congenital and neuromuscular scoliosis, as well as other spinal deformities such as spondylolisthesis. Spinal deformities in the adult population are also included.

This book is based on Schroth Best Practice protocols. While still based on the original Schroth method, its modifications, enhancements and simplifications allow for a more user-friendly experience. The pattern-specific scoliosis rehabilitation (PSSR) techniques are designed so that patients can integrate Schroth principles into everyday life. When protocols change, there is often criticism. However, it is important to continually improve methodology for the benefit of the patient. They deserve the best we have to offer as clinicians.

Successful conservative treatment requires an intimate knowledge of spinal biomechanics. To that end, practitioners should spend time educating their patients. When the patient understands their unique spinal configuration, it is the first step in grasping the concepts needed to achieve change.

At the same time, practitioners must make it clear that while Schroth-based treatments have great potential, close adherence and consistent effort is required. Each spine will respond differently to treatment and results are not guaranteed. For realistic expectations, it is important to discuss short and long-term goals with patients and their families. As well as providing quality treatment, the practitioner can be an impactful presence and help empower patients.

In addition to those who contributed to this text I would also like to thank my incredible team. They are all enthusiastic advocates for the conservative treatment of scoliosis and kyphosis and work hard on behalf of patients everywhere. Lastly, I would like to thank my wife who has always provided unwavering support and encouragement through the highs and lows of this journey.

Marc M Moramarco, DC

CHAPTER ONE

HISTORICAL ASPECTS OF SCOLIOSIS TREATMENT¹

HANS-RUDOLF WEISS,
KATHRYN MORAMARCO
AND MAKSYM BORYSOV

From Ancient Times to the 20th Century

Scoliosis was recognized as early as the 5th century BC when Hippocrates (460-375 BC) described scoliosis and its treatment (Fig. 1.1). His belief was that one of the causes of the deformation of the vertebrae was the luxation of the spine. He tried to counteract this luxation using mechanical devices. In the process, he made use of the Hippocratic luxation table [1]. The Romans also recognized the Hippocratic luxation table. Galenos (130-201 AD) described spinal deformations in the following way: kyphosis (curvature to the rear), lordosis (curvature to the front), and scoliosis (lateral curvature) [2]. In the 16th century, the Hippocratic braces were described and would go on to be promoted by Paré [3].

It was only at the beginning of the 19th century and particularly at the beginning of the 20th century when a systematic orthopedic physiotherapeutic method was introduced. This physiotherapeutic treatment was supported by the founding of various orthopedic institutions. These institutions which made time-intensive treatment possible were a prerequisite for successful education concerning posture. In these special

¹ Based on a chapter published in Weiss, Lehnert-Schroth, Moramarco & Moramarco: Schroth Therapy. Lambert Academic Publishing, 2015, and on Moramarco K and Borysov M. A Modern Historical Perspective of Schroth Scoliosis Rehabilitation and Corrective Bracing Techniques for Idiopathic Scoliosis. The Open Orthopaedics Journal, 2017, 11, (Suppl-9, M2) 1452-1465.

institutions, brace-fitting occurred under the supervision of a doctor - often for hours on end.

In the same century, however, the first supportive exercises were carried out, frequently with the help of mechanical correction devices that were specially constructed for the treatment of scoliosis (Figs. 1.2-1.3). Residency in these establishments was very expensive and few people could afford such treatment [4].

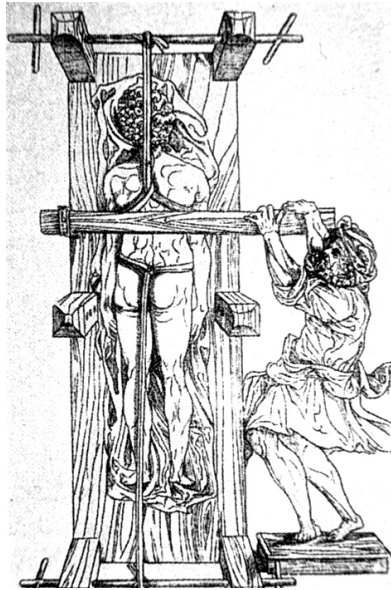


Fig. 1.1: The “luxation table” from Hippocrates.

In the 19th century, Zander [5] tried to overcome the problem of large staff costs with the construction of diverse equipment. Instead of manual resistance from the therapist, he employed suitable devices with resistance for the patient to overcome which could be increased or decreased as one desired, with the extent of the resistance being set using weights.

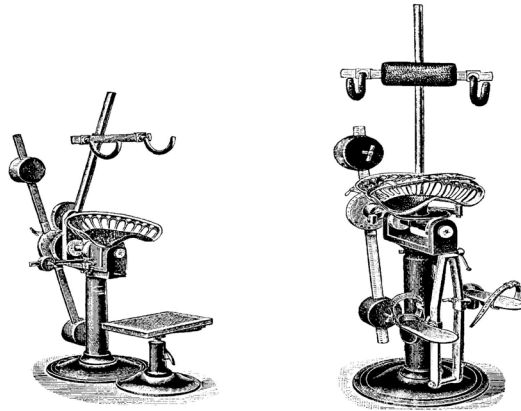


Fig. 1.2: Representation of two correction devices for spinal gymnastics. The trunk moved against the seat area, which was why these devices were described by Schanz [4] as "trunk pendulums."

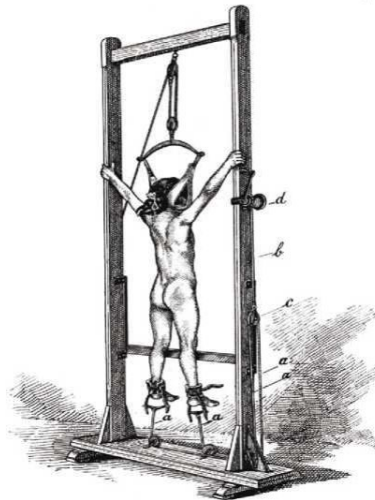


Fig. 1.3: Correction devices for suspension and correction in preparation for the plaster bandage treatment [4].

Lorenz [6] and Hoffa [7] developed treatment in the passive upright position. In this treatment, one attempts to achieve a correction of the spine by way of passive reshaping. Lorenz introduced reshaping exercises, which were executed with the assistance of specialized equipment (Fig. 1.4). Hoffa [6] introduced active exercises in the upright position for the treatment of scoliosis. Parallel to the manual upright attempts, therapy was also developed which utilized machines, as used by Wullstein [8]. Patients were initially stretched using various instruments, and, in order to stabilize the spine, patients were immobilized in plaster or wore braces for many years.

Klapp [9] developed his own method (pre-1905). This method was expanded into a physiotherapeutic system by the development of specific exercises that were tailored to the various forms of scoliosis. He raised awareness that muscles, bones, and ligaments can only be strengthened through functional use. Thus, his system was a forerunner of functional physiotherapy. The Klapp technique consisted of actively mobilizing the spine and simultaneously strengthening the musculature to help retain flexibility. Klapp observed that good results could only be achieved if these exercises were carried out for at least two hours a day. His method had many enthusiastic supporters, but soon had its critics too, some of whom pointed to possible deterioration of the countercurve due to his method [10], while others generally criticized the mobilization of the spine [11].

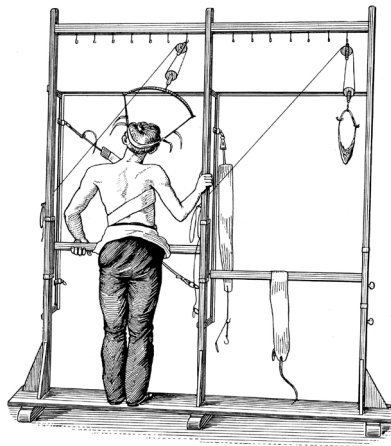


Fig. 1.4: Modification of the Lorenz spiral cables, from Schanz [4]. This was a passive correction device used several times a day to achieve a corrective effect for treatment taking place over the course of many months.

Concerning the load-bearing deformities of the spine, Schanz [4] provides an overview of the possible treatments that were available at the time. He includes questions concerning everyday activities, and, in particular, he provides information concerning the furniture used in schools. He also presents the benefits of massage and remedial gymnastics (Fig. 1.5), which, in his opinion, can be summarized as follows: massage and remedial gymnastics can contribute to the minimizing of the static demands on the spine. They do this by reducing the period of time in which the spine is in a position of fatigue and, therefore, subject to relatively high static demands. Massage and remedial gymnastics can also contribute to an increase of the static performance of the spine. By improving the general condition of the body and strengthening the spinal musculature, they help to bring about an increase in the rigidity of the osseous tissue in the spine.

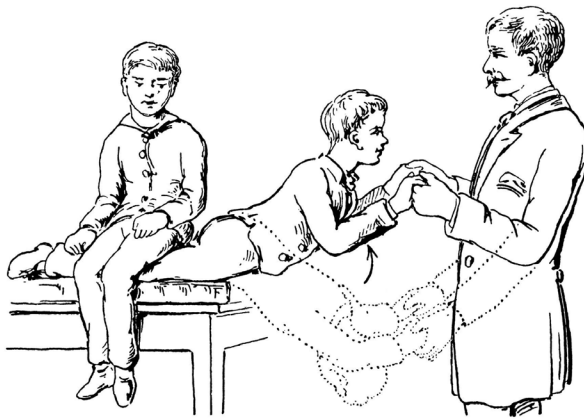


Fig. 1.5: Staff-intensive upright exercises to strengthen the trunk muscles [4].

Schanz [4] valued the advantages of massage and remedial gymnastics all the more since there were apparently no significant disadvantages to the techniques.

Brace treatment was introduced, as well as correction devices that were intended to support the “plaster bandage treatment.” After correction therapy in the plaster mold, acceptable results were achieved. Interestingly, the brace treatment available at that time differs from contemporary treatment only slightly. The “portative correction device” also shares similarities to the dynamic correction brace (DCB) used today.

Swedish remedial gymnastics, according to Ling's method [12], grew in popularity at the beginning of the 20th century. Ling used resistance exercises in sitting, standing, and hanging positions, as well as lying on the front and the back.

Oldevig [13], who was instrumental in the introduction of Swedish remedial gymnastics in Germany, had recognized the disadvantage of these resistance exercises which needed to be carried out under the guidance of at least one doctor or physiotherapist (Figs. 1.5-1.6).

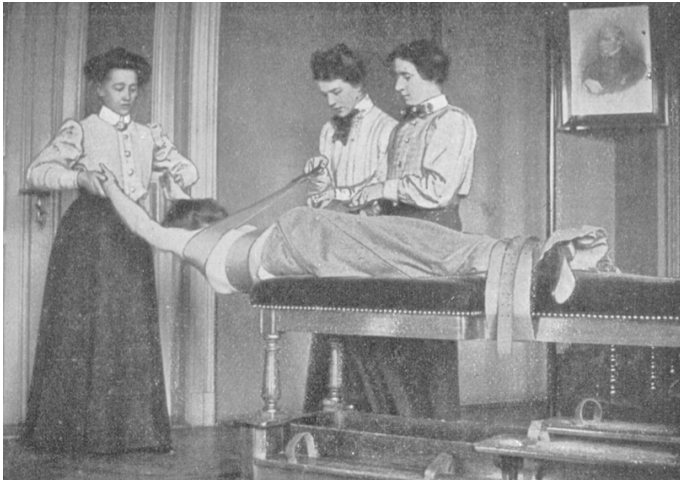


Fig. 1.6: Staff-intensive physiotherapy for spinal deformities – the strap is pulled [13].

With his belt exercises (Figs. 1.7-1.8), Oldevig tried to isolate individual curvatures and work on them in that way. The aim of the belt exercises was to trigger muscle activity. Oldevig believed that muscle activity could be achieved more conveniently, more precisely, and more effectively through belt exercises than through any other method. He saw the “gymnast” as a modeler who reshapes the living body. He demanded a high level of independent reflection, much feeling, and visual judgment from the gymnast. The exercises he developed are based on anatomical principles and it was of absolute importance to him that compensatory curvatures not be increased during the exercises.

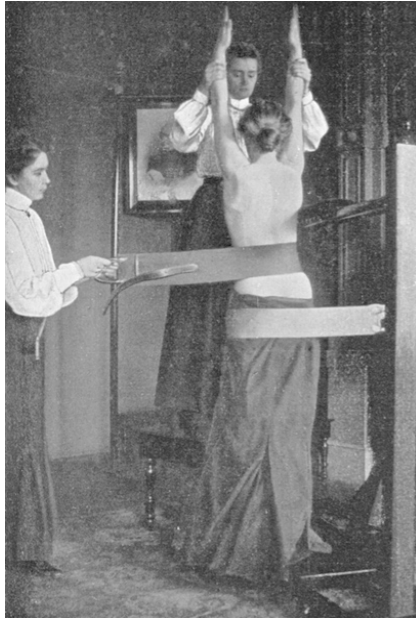


Fig. 1.7: Therapy involving pulling a strap in a standing position, with extra staff assisting [13].

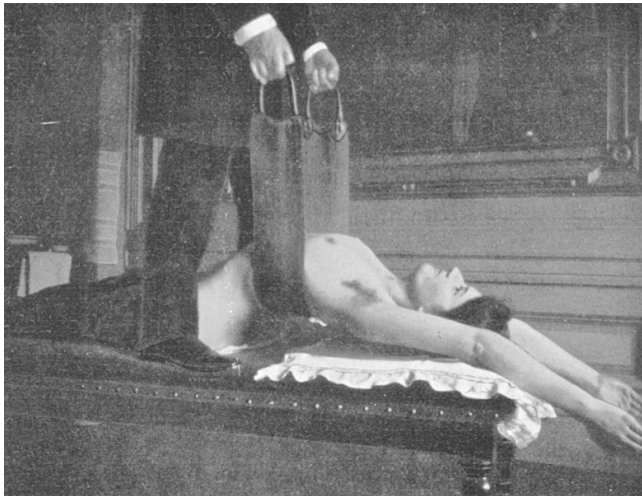


Fig. 1.8: Lordosis exercises for kyphosis according to the Oldevig method [13].

For Lange [14], scoliosis was a disruption of the muscular balance. He constructed various resistance devices with which he wanted to achieve an overcorrection of the spine. The patient had to rebend the spine on the concave side against the resistance of the device in order to achieve the desired overcorrection.

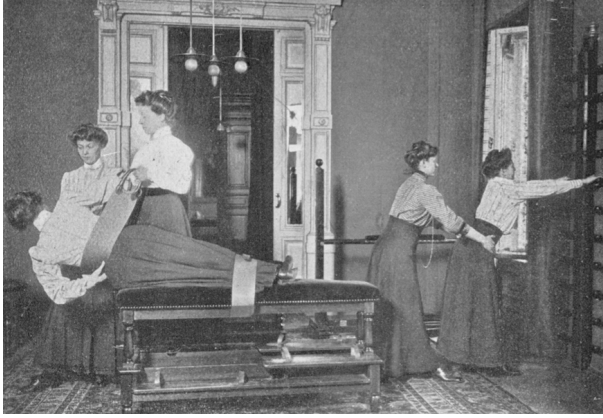


Fig. 1.9: Typical setting of the correction exercises, according to Oldevig, at the wooden bars and on the exercise bench [13].

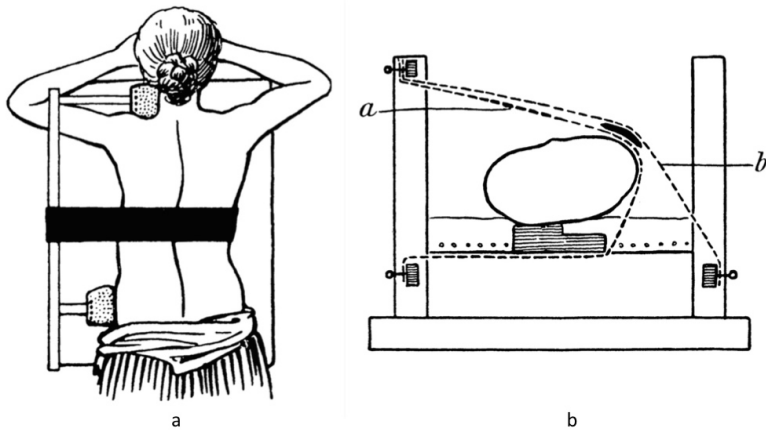


Fig. 1.10: (a) A schematic representation of the three-point principle for correction in a belt device and (b) schematic representation of correction straps that looped the costal hump dorsolaterally [14].

Everyday activities played an important role. Lange [14] visualized the scoliosis curvature using his “diopter” and could thus monitor the success of the treatment. The goal of his treatment was to correct the insufficiency in the erector spinal muscles. He was of the opinion that there were two conditions that had to be satisfied in order to tackle scoliosis effectively: The scoliosis-affected spine needed to be rebent forcefully, both actively and passively (Figs. 1.9-1.10); the devices used for the active and passive overcorrection needed to be as simple as possible (Fig. 1.11).

Lange [14] also observed the countercurve and stated that an overcorrection must be strictly limited to the section of the spine that was distorted. It was for this reason that he was unable to sympathize with “the original idea of the highly esteemed Bonn-based surgeon Klapp,” who wanted to heal scoliosis using crawling.

Blencke [15] was an advocate of the more specific treatment approach for scoliosis. He distinguished between remedial gymnastics for general treatment and a form of correction gymnastics for a direct influence on the pathological form of spinal deformities (Figs. 1.12-1.13). He rejected the idea that anyone, or even any gymnastics teacher, could provide treatment for scoliosis. For serious cases of scoliosis, he believed that asymmetric exercises were indispensable (Fig. 1.14a-b). Just as Schultheß did, he viewed special orthopedic gymnastics for the treatment of scoliosis as work to be tailored to the individual case. Treatment involved an overcoming of resistances in specially chosen positions, with certain parts of the skeleton being held in a fixed position with the elimination of certain secondary movements and undesired side effects. Blencke [15] also viewed the Klapp crawling exercises in a negative light, since, in his opinion, gymnastic scoliosis treatment needed to be tailored to the individual.

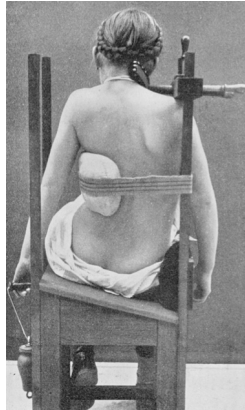


Fig. 1.11: A patient sitting in a three-point correction device [14].



Fig. 1.12: The torsion pattern of a thoracic vertebra with scoliosis. The vertebral body tends to the right whilst the zygapophyseal joint lies more to the left and the spinous process points to the right. Furthermore, there is a wedge-shaped formation that is not shown on this image [15].

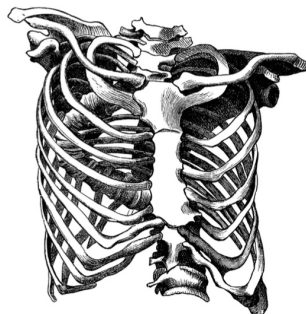


Fig. 1.13: Torsion of the ribcage with thoracic scoliosis [15].

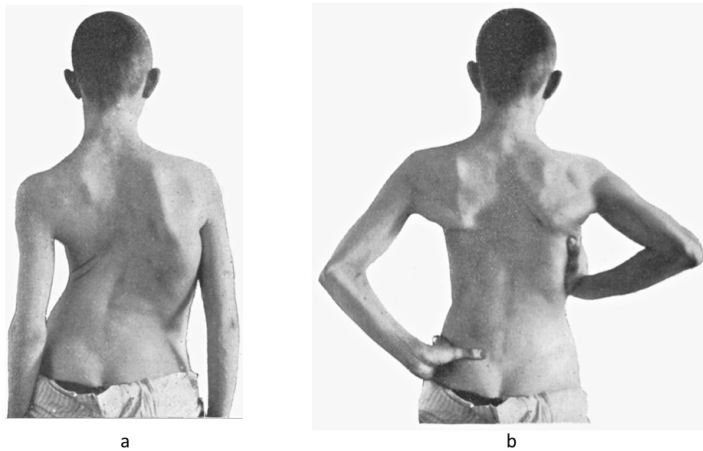


Fig. 1.14: (a) A patient with right thoracic scoliosis and left lumbar counterswing before the exercise. (b) The patient in the auto-correction, which was to be carried out several times a day [15].

Around the end of the second decade of the 20th century, Katharina Schroth developed her three-dimensional scoliosis treatment. As she observed her own scoliotic body, and the way it reacted with movement, she created specific corrective mechanisms and a corrective breathing technique that she named “rotational breathing” (Fig. 1.15a-b). Along with the rotational breathing technique, Schroth’s holistic principle was new to the treatment of scoliosis. Katharina Schroth wanted to influence scoliosis via a change in the entire feeling of the body.

Schroth’s three-dimensional treatment for scoliosis enjoyed increased popularity with the opening of her first institute in Meißen in 1921. For the first time, scoliosis wasn’t simply seen in a mechanical light – although the mechanics by no means played an inferior role. Katharina Schroth introduced sensorimotor kinesthetic principles to the treatment options of scoliosis. These principles use the most active correction possible to provide a sense of awareness in order to avoid curvature-exacerbating behavior in one’s daily routine (Figs. 1.16-1.17). Breathing was also integrated as a crucial factor in the correction of scoliosis not only of the ribcage, but also of the lumbar spinal region [16-19]. After introducing these principles, treatment of three to six months duration would be carried out with the most serious cases of scoliosis.

The successful treatment of curvatures, some of which were very significant and rigid, can be seen in the first publications from the Katharina Schroth Institute (Figs. 1.15-1.17). However, in a report whose contents only became known after the Second World War, Prof. Schede from Leipzig criticized the treatment as early as the '20s, describing the treatment as "charlatanism that people must be warned against." This criticism was so influential that it led to the temporary removal of Franz Schroth – Katharina's husband – from his professional position.

In 1924, Katharina Schroth published the small volume 'Die Atmungskur' [16]. The Essen-based Dr. Grewers wrote the following in the foreword:

"Personally, I can already judge that which I have seen and I will never fail to recommend this technique to patients in certain cases, since I know that it will be of help to them where everything else has failed them. I do not believe I am saying too much when I claim that this remedial system has a full medical grounding and that a medical practitioner free of prejudice can use it side-by-side with the existing remedial system."

The volume was not intended necessarily for those suffering from scoliosis, but rather contains information for exercises for all patients suffering from collapsed posture. However, Katharina Schroth makes it clear that she addresses the treatment of scoliosis with particular focus. This is evident in the following treatment description:

"I then brought out the left side slowly but surely using one-sided breathing and many types of gymnastic exercises. Since there was a double curvature, I of course had to be careful that none of the exercises helped one part but damaged the other. It is often the case that canceling-out exercises must be carried out. Meticulous observation and many years of experience also allow one to avoid these pitfalls."



Fig. 1.15: Execution of the rotational breathing technique with a severe thoracic distortion (a) before the exercise and (b) during the exercise. Positive results were observed after many months of treatment.



Fig. 1.16: Strengthening the feeling of posture via the use of so-called “redressment (corrective) grasps” and “breath grasps” to improve the corrective movement during exercising.



Fig. 1.17: Use of mirror control in order to facilitate auto-correction with the assistance of breathing.

In 1929, Katharina Schroth presented her increasingly holistic approach in a second illustrated brochure [17]:

“Why is it so often the case that gymnastic efforts to straighten out the spine of a child suffering in this way so often result in failure? Because one approaches the child in a far too mechanical way, far too exercise-oriented, without first investigating the difficulties the child experiences in life, the unendurable problems they have – problems that might well seem insignificant to an adult. Getting the external person to stand up straight and erect their spine will only be possible if you first allow the inner person to 'stand up straight,' to give them hope, to allow them to 'breathe out.' Here, language shows itself to be much smarter than the current materialistically minded generation of, let us say, practitioners who view the human as a machine.”

In *Naturmedizin* (Natural Doctor), a publication from 1931, Katharina Schroth wrote the following about the rotational breathing technique [18]:

“It is challenged on many sides that one can control one’s breathing so precisely that it will go where we want it to go. To achieve it, the teacher must help the pupil to develop a sense of control for the right load and the wrong load, for the proper orientation of the rib joints at the right location.”

The principle of “helping the patient to help themselves” is also present in the same article:

“If one considers how terrible the lot of those who suffer from spinal deformations is, how ostracized they must feel simply due to their appearance, how limited they are in their professional life, how reduced their joy in life is, then one must accept that in order to achieve an improvement to this situation – something that is perfectly possible – a brief education with expert instruction must first create a foundation that can then be built upon at home in self-treatment.”

On the subject of “body feeling,” the following statement from Katharina Schroth appears in a special edition of a journal from the upper Ore Mountains region in 1935 [19]:

“It is self-evident that the patient must be activated in each and every sense: bodily, mentally, and emotionally; that they themselves must take on the struggle against their suffering – for the character, this educational influence brings with it intense repercussions. With precise and specific work one can unlock the potential to develop the patient’s body feeling and to generate a sense of the body on a higher level, so that even work involving layers of muscle buried deep under other layers is under command and can be carried out precisely. This is a scenario whose possibility of fulfillment leaves even highly educated professional gymnasts lost for words.”

At the same time there were other professionals working on scoliosis treatment systems. A system developed by Gocht [20] and Gessner initially concerned itself with an equipment-based treatment of scoliosis; later, exercises based on their work were developed at the Charité Hospital in Berlin. Mater wrote the following on the subject [21]:

“The scoliosis exercises that Gocht and Debrunner described in their book *Orthopedic Therapy* from 1925 are not the same as those that are carried out today. In this book, above all it is corrections of the spine that are described with the patient in a passive role. Treatment is through hand pressure against the costal hump and thus a movement of the trunk against the pelvis, or in the case of lumbar scoliosis, a pelvic inclination on the

concave side via re-location and relief of the affected leg. Gocht describes these as an active static recurving. The exercises that Ms. Gessner arranged at the Berlin Charité Hospital in later years, which are in principle still broadly in use today, are actually exercises taken from Swedish remedial gymnastics. Here, one tries to counter the lateral inclination and twisting of the spine simply through active muscle work in the form of stretches and the isolated tensing of the convex side transverse musculature.”

For Hug [22], the degenerated muscle fibers have a central role in scoliosis. He stated, “the earlier the onset of scoliosis, the more drastic the bodily deformation.” His principle for treatment is the “temporary overcorrection on the other side.” From a mechanical perspective, he is in agreement with Lange and Schroth.

Musculature was also of key importance for Port [23]. He was of the opinion that the development of rachitic scoliosis was dependent upon the condition of the musculature. This meant that the practitioner’s entire attention must be turned towards the musculature and that measures of redressment and supportive braces only be worn for the sake of the musculature.

Farkas [24] noted that with thoracic scoliosis a lordosis can be observed. On the other hand, he noted that kyphosis had the opposite effect. He describes the paradoxical phenomenon that, in actuality, the costal hump is increased by lordosis, reduced through kyphosis and therefore, in terms of the apparent degree of costal hump, lordosis and kyphosis behave inversely. He was of the opinion that the development of “habitual” scoliosis took place in the same way and was caused and promoted by the same factors as physiological scoliosis, namely from the mechanics of walking. There is a quotation from him that the admonishers amongst those involved in therapy should bear in mind:

“A child that continues to sit improperly, despite “reminders,” does not get scoliosis, but rather already suffers from it. The reclining position of a child suffering from scoliosis is indeed a scoliotic position, because it demands the least possible work and because all other reclining positions are associated with effort by the child and are therefore no longer actual comfortable reclining positions.”

This opinion is as relevant today as it was then and should also be taken into consideration in the conceptual development of scoliosis treatment.

On the subject of therapeutic goal setting, Farkas said the following:

“The principle of functional therapy for scoliosis is based on the restriction of damaged functions.”

Farkas believed that the contraction of the spine could be corrected, in terms of inclination. He went on to explain that one could only influence the portion of the costal hump that arose from the rotation of the trunk.

Heuer [25] summarizes the work concerning the etiology of scoliosis and develops a self-sufficient model of scoliosis.

Despite Katharina Schroth's scoliosis treatment being received warmly in many circles, Lempert and Brodermann [26] still favored the Klapp exercises. However, the authors were not critical of the exercises and expressed no position with respect to the possible deterioration of countercurves as a result of this treatment method – the reason this method came under fire from critics two decades earlier.

At the beginning of the 20th century, Egon von Niederhöffer also concerned himself with the biomechanics of the back musculature in cases of scoliosis. In her publications from 1929 and 1936, Luise von Niederhöffer does not yet exhibit a physiotherapeutic concept [27,28]. It was only in 1942 that the Niederhöffer treatment principle was presented along with a sequence of exercises [29] (Fig. 1.18) – this would later be refined by Becker [30].

After the Second World War, Katharina Schroth and her daughter Christa relocated to the west and founded a new institute in what was then known as Sobernheim, following the wards in Bad Steben and Bad Kreuznach. This institute was initially exclusively private but was then run as a sanatorium from the beginning of the '70s. Here, Katharina Schroth's three-dimensional scoliosis treatment was developed further and quickly became more and more well known. Before the end of the '70s, the effect of stationary intensive rehabilitation of the breathing function was studied with a comparison group. Götze [31] was able to show that this kind of intensive program not only increased cardio-pulmonary performance, but also the vital capacity; in contrast, the vital capacity showed no significant change after a four-week aerobic fitness program.

The Katharina Schroth Clinic became the target of multiple accusations from critics, despite being led by medical professionals. Using an academically led “method fight,” opponents tried to annul the Schroth concept. After the conflict was resolved, the Schroth method received recognition from most medical professionals as well as from German insurance companies.

In the '50s, a treatment that Vaclav Vojta had been developing to treat children with cerebral palsy began gaining the interest of German therapists [32]. This treatment based on kinesiologic methods was also used by therapists treating scoliosis. With this method, the belief was that, with the assistance of facilitation of the reflex movements, the muscular imbalance that exists in patients suffering from scoliosis can be compensated through central mechanisms. Many mistakenly believed that the correction could be predominantly traced back to the increase in activity of the segmental dorsal musculature, which is partially degenerated in the case of scoliosis (Fig. 1.19).



Fig. 1.18: Description of von Niederhöffer's treatment principle. Above the surface musculature a correction movement was carried out on the spine with the help of the thoracic concave side arm. This is contrary to the three-dimensional scoliosis treatment developed by Schroth where the ribcage is first corrected and the thoracic convex side arm is pulled against the ribcage correction over to the thoracic convex side, in order to correct the cranial section (modified from Weber and Hirsch 1986 [35]).