STANDARDIZING EXERCISE INTERVENTIONS FOR SCOLIOSIS: EXERCISE TYPE, INTENSITY, DURATION AND FREQUENCY OF SESSIONS.
Exercise interventions for scoliosis

- **Generalised Physical Therapy interventions**
- **Physiotherapeutic scoliosis-specific interventions**
Generalised PT exercises

- Routine generalised PT (GPT) more generic,
- usually consists of low-impact stretching/strengthening activities e.g. yoga, pilates, tai chi,
- Can include many different exercise protocols according to the preferences of the therapist e.g. McKenzie exercises
What exactly are Physiotherapy Scoliosis Specific Exercises (PSSE)?

- PSSE's consist of individually adapted and curve-specific exercises
- taught to patients in a centre that is often totally dedicated to scoliosis treatment.
- Patients learn an exercise protocol that is personalized
- according to medical and physiotherapeutic evaluations of the individual's scoliosis curves characteristics
GOALS OF PSSE according to SOSORT

1) to stop curve progression at puberty (or reduce it),

2) to prevent or treat respiratory dysfunction,

3) to prevent or treat spinal pain syndromes, and 4) to improve aesthetics via postural correction.

Further, when patients are prescribed a rigid brace, SOSORT always recommends the associated use of PSSE.
PSSE Principles

- Based on a specific form of auto-correction,
- spinal elongation
- Isometric exercise contraction
- taught individually to each single patient.
- PSSE are also incorporated into activities of daily living

- These are inserted into stabilizing exercises
- can include neuromotor control,
- Proprioceptive balance training
- depending on the specific PSSE school
- Practised at home
- Ideally under parental supervision
EXERCISE TYPE : DIFFERENT APPROACHES (SCHOOLS) TO EXERCISE INTERVENTIONS IN SCOLIOSIS
1. The Lyon Approach

- The basis of the Lyon method is to avoid spinal extension during exercise and enhance kyphosis of the thoracic region with lordosis of the lumbar spine as well as frontal plane correction, segmental mobilization, core stabilization, proprioception, balance and stabilization.

In the Lyon approach, a great emphasis is given to exercises done in the plaster cast prior to bracing and during bracing to encourage equilibrium and muscular strength and endurance while in the cast or brace.
Fig. 3 Scoliosis patient developing self-awareness of postural defects with the help of a video recorder and real-time video feedback.

Fig. 4 Active thoracic mobilization, promoting kyphosis, using the Lyon method.

Fig. 5 Active lumbar correction, promoting lordosis, using the Lyon method.

Fig. 6 (a, b) Active thoracic shift exercise with a dowel (a) and a Swiss-ball (b) using the Lyon method.
The Schroth Method (Germany)

Schroth method was developed by Katharina Schroth in 1920 continuously refined through the treatment of approximately 3,000 scoliosis cases per year.

The Asklepios Katharina Schroth Spinal Deformities Rehabilitation Centre in Germany (Fig. 21) offers a scoliosis-specific intensive inpatient rehabilitation program.

In addition to the treatment offered at the Centre, 2,500 trained and certified Schroth therapists treat patients through the center’s residential outpatient treatment program.
Fig. 24 (a, b, c, d): Schroth Body Blocks. The Schroth system of scoliosis curve classification is derived from the Schroth principle of dividing the body into “body blocks” as pictured anatomically (a) and schematically (b). Scoliosis causes the body blocks to become deformed, changing their geometric shape from a rectangle (b) to a trapezium (c). A patient with a major lumbar scoliosis left convex curve has a lumbar block shifted to the left and a hip-pelvic block shifted to the right (d).
In the Schroth method there are five pelvic corrections that are assumed prior to the
execution of the main principles of correction.

These five pelvic corrections ensure that the pelvis is best aligned with the trunk prior to
the major corrections.

The five principles of the Schroth method are: 1) Autoelongation (detorsion);
2) Deflection;
3) Derotation;
4) Rotational breathing; and
5) Stabilization.

During the application of these principals, as with the BSPTS method, the
patient is taught how to de-collapse the concaved areas of the trunk and how to
reduce the prominences.
**Fig. 28** The Schroth prone exercise with activation of the iliopsoas muscle (right hip flexion). Blue arrows represent trunk elongation with caudal and cranial forces. Red arrows represent areas of muscle activation around the convexities towards the midline. Green half-moons represent areas of expansion of the concavities. Red circles represent additional corrective forces. Red circles around the right lower extremity and the right upper extremity represent iliopsoas activation and shoulder traction/counter-traction, respectively, resulting in correction of the lumbar and thoracic curves.

**Fig. 29** The Schroth "Sail" exercise where the patient stands on a sail foam-roll with two poles and performs active stabilization. The red circle represents the concavity (weak side according to Schrith). During active stabilization, the patient is consciously expanding the left rib cage with right directional breathing, opening the collapsed left lung, while maintaining 3D postural correction.
Fig. 31 Patients performing Schroth 3D postural corrections in sitting and standing positions. These postural corrections are practiced during activities of daily living in order to change habitual default postures and improve alignment, pain, and curve progression.
Scientific Exercise Approach to Scoliosis (Italy)
Italian SEAS Method

e autocorrection according to the SEAS protocol proposed by the ISICO School (intrinsic autocorrection).
EXERCISE INTENSITY, DURATION AND FREQUENCY
<table>
<thead>
<tr>
<th>School</th>
<th>Inpatient or Outpatient</th>
<th>Treatment frequency</th>
<th>Home program</th>
<th>Country of Origin</th>
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<tbody>
<tr>
<td>SEAS</td>
<td>Outpatient</td>
<td>1 individual session of 90 min for introducing the approach, and the teaching and the video recording of the exercises program every 3 months</td>
<td>Repetition of the exercises in a gym or at home with the assistance of a PT or a parent for 45 min 2-3 time a week + 5 min daily. The patient can choose to not perform the long session (45 min) and perform the program for 20 min daily instead.</td>
<td>Italy</td>
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<td>SCHROTH</td>
<td>Inpatient</td>
<td>4-6 daily hours for 30 days in a specialist clinic.</td>
<td>The treatment includes 3-4 exercises at home for 30 minutes daily 5 times per week to maintain the improved postural balance.</td>
<td>Germany</td>
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<tr>
<td></td>
<td>Outpatient</td>
<td>Two hours for two days per week with Certified Schroth therapists.</td>
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<td>BSPTS</td>
<td>Outpatient</td>
<td>BSPTS offers different frequencies and different modalities to treat patients: INDIVIDUAL local PATIENT’S: 1h session each week. Depending on the quality of the execution of the correction, the PT will space the sessions as needed. INDIVIDUAL foreign PATIENT’S: 2h session; 10 consecutive days. To be complemented by 1 or 2 more weeks 3 to 6 months later depending on the level of knowledge acquired. INTENSIVE COURSE: 20 continuous days in group sessions of 3h/each. REGULAR COURSE: 30 sessions of 1h30 in groups. Spread out after initial 8 sessions over a short period as the patient acquires the capability to perform the exercises properly</td>
<td>For all: home exercises 5 days per week for 45-60 min./day</td>
<td>Spain</td>
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<tr>
<td>Country</td>
<td>Inpatient/outpatient</td>
<td>Treatment Details</td>
<td>Home Exercise Details</td>
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<td>DOBOMED</td>
<td>Inpatient or outpatient</td>
<td>5 days/wk X 40 min over 3 weeks Or 60 min per week continuously Or Repeat stay as above.</td>
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<tr>
<td>SIDESHIFT</td>
<td>Outpatient</td>
<td>1 individual session of 10 min for the preparation and the teaching of the exercises.</td>
<td>Home exercises daily for 10 min with or without assistance from parents Japan</td>
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<tr>
<td>FITS</td>
<td>Inpatient</td>
<td>A 14-days inpatient program once a year. 1 individual session (45-60 min) with PT 1-4 times per month. with frequency related to the Cobb angle, maturity, risk of progression and distance from clinic.</td>
<td>For all: during exercises with PT the Parent’s presence is required. Daily home exercises for 20-30 min. Poland</td>
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<td>LYON</td>
<td>Outpatient</td>
<td>Used during plaster cast or during 24h bracing (1 to 4 months) 2 sessions/week with a PT After 4 months, 1 session/week</td>
<td>Daily exercises at home Sport without limitation France</td>
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SOSORT guidelines

- SOSORT guidelines\textsuperscript{23}, PSSE are recommended as part of a range of interventions deemed appropriate,

- Depending on the patients’ and therapist’s willingness to consider more or less aggressive options given the perceived risk of progression determined based on patients age, skeletal maturity and curve severity.
The level of evidence for SSE for AIS is not high.

The existing evidence concerning SSE, which is classified according to the Oxford Centre for Evidence Based Medicine\textsuperscript{27}, can be summarized as follows:

- Physiotherapeutic scoliosis-specific exercises (PSSE) can be recommended as a first step in the treatment of AIS to avoid and/or limit curve progression (grade B)\textsuperscript{20;22;23;28-31}. 

Indications according to current evidence
Recent systematic reviews \(^28\rightarrow 31;40\) have shown the possible effects of PSSE`s on scoliosis primarily in terms of Cobb angle, based on controlled studies, which were mainly observational and partly prospective.

A Cochrane Review \(^30\) on the effectiveness of scoliosis-specific exercises for patients with idiopathic scoliosis found that, despite a comprehensive search of published and unpublished literature, only two studies met the stringent Cochrane methodological criteria.

Quantity and quality of the research to date and their limitations
Of these only one was a randomised controlled trial; this trial compared a protocol of exercises, electrostimulation, traction and postural training to a protocol of electrostimulation, traction and postural training. This study provided very low quality evidence in favour of PSSE's versus the same protocol without exercises.
RCT`s

The effect of Schroth exercises added to the standard of care on the quality of life and muscle endurance in at adolescents with idiopathic scoliosis—In an assessor and statistician Sanja Schreiber, Eric C Parent.


The efficacy of three-dimensional Schroth exercises in adolescent idiopathic scoliosis: A randomised controlled clinical trial Tuğba Kuru1, İpek Yeldan2, E Elçin Dereli3, Arzu R Özdinçler2, Fatih Dikici4 and İlker Çolak, Clinical Rehabilitation 1-10 2015

Active Treatment for Idiopathic Adolescent Scoliosis (ACTIvATeS): a feasibility studyHealth Technology Assessment, No. 19.55 Mark A Williams, Peter J Heine, Esther M Williamson,
The Effect of Schroth Therapy on Thoracic Kyphotic Curve and Quality of Life in Scheuermann’s Patients: A Randomized Controlled Trial

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