Physiotherapy Scoliosis Specific Exercises (PSSE): Definition, goals and indications according to current evidence

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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.
Principles

- Based on a specific form of auto-correction,
- spinal elongation, exercise contraction,
- taught individually to each single patient.

- These are inserted into stabilizing exercises,
- can include neuromotor control, proprioceptive training, balance,
- depending on the specific PSSE school⁴
- PSSE are also Incorporated into activities of daily living
- Practised at home
- ideally under parental supervision.
Italian SEAS Method

The autocorrection according to the SEAS protocol proposed by the ISICO School (intrinsic autocorrection).
Schroth Method
Generalised physiotherapy exercises

- Routine generalised physiotherapy (GPT), is more generic,

- usually consisting of low-impact stretching strengthening activities like yoga, pilates or tai chi (taiji),

- Can include many different exercise protocols according to the preferences of the therapist e.g. McKenzie exercises
treatment approaches adopted by various orthopaedic surgeons and physicians specialised in the field of conservative management of scoliosis are divided indicating a lack of agreement across the professions and different countries.

In general these approaches can grossly be split into two opposing groups: the first group regard the exercises as useless, while the second group use them and advocate their efficacy (Negrini et al, 2005).
two conflicting views seem to prevail in two different regions of the world:

in the US and UK, the wait and see strategy prevails, ie no PSSE just observation till the curve reaches approx 50 degrees

In various parts of continental Europe, Eastern and Southern Europe, conservative treatment (PSSE`s and bracing) is considered to be of benefit to the patient and prescribed routinely by the large majority of scoliosis physicians and surgeons.
The understanding within the generalised AIS treating community in the UK and USA may be based on the effectiveness of generalised physiotherapy (which is not curve-specific) which has to date not been shown to be effective.  

Figure 4: Transversus Abdominis muscle strengthening
A possible reason for the negative beliefs towards PSSE within the clinical community in the Anglo-Saxon world is the lack of knowledge within the physical therapy community and associated clinical specialists.

PSSE are not taught at either undergraduate or post-graduate level within the physiotherapy curriculum in the UK (Canada, Australia, United States?)

Most clinicians (both physiotherapists and surgeons) in the these jurisdictions normally do not appreciate the difference between PSSE and general physiotherapy.
Conflicting approaches

- The conflicting approaches are also reflected in the guidelines
- (SOSORT)^23 composed mainly of rehabilitation specialists, physiotherapists, orthotists, AHP`s
- the Scoliosis Research Society (SRS) which includes mostly surgeons.
The SRS guidelines say the following about the use of PSSE:

“Alternative treatments to prevent curve progression ... such as chiropractic medicine, physical therapy, yoga, etc. have not demonstrated any scientific value in the treatment of scoliosis. However, these and other methods can be utilized if they provide some physical benefit to the patient such as core strengthening, symptom relief, etc. These should not, however, be utilized to formally treat the curvature in hopes of improving the scoliosis.”
In contrast the recently published SOSORT guidelines\(^2\), 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.
SOSORT GOALS OF PSSE

- **Skeletally immature** patients (Risser sign of 3 or less) with curves between 11° and 30° and

- In **skeletally mature** patients (Risser 4 or 5) with curves 11° to 45°
  - to stop curve progression at puberty (or reduce it),
  - to prevent or treat respiratory dysfunction,
  - to prevent or treat spinal pain syndromes
  - to improve aesthetics via postural correction.

Further, when patients are prescribed a rigid brace, SOSORT always recommends the associated use of PSSE.23
Indications according to current evidence

- The level of evidence SSE For AIS is not high.
- The existing evidence concerning SSE, which is classified according to the Oxford Centre for Evidence Based Medicine\(^2\), 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) \(^{20;22;23;28-31}\).
Recent systematic reviews \(^{28-31;40}\) 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.
Of these only one was an RCT

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.
Conclusions
The programme of active self-correction and task-oriented exercises was superior to traditional exercises in reducing spinal deformities and enhancing the HRQL in patients with mild AIS. The effects lasted for at least 1 year after the intervention ended.
Abstract: OBJECTIVE: To compare the therapeutic effects of a 3-dimensional corrective spinal technique (CST) and a conventional exercise program (CE) on altered spinal curvature and health related quality-of-life in patients with adolescent idiopathic scoliosis (AIS).

METHODS: Adolescents with idiopathic scoliosis (N=32, 6 males and 26 females) between 10 and 19 years of age (14.34 ± 2.60 years) were recruited and underwent the CST or CE for 60 minutes/day, 2–3 times a week, and an average of total 30 sessions. Diagnostic X-ray imaging technique was used to determine intervention-related changes in the Cobb angle, thoracic kyphosis angle, lumbar lordosis angle, sacral slope, pelvic tilt, pelvic incidence, and vertebral rotation (Nash-Moe method). The Scoliosis Research Society-22 (SRS-22) health related quality-of-life questionnaire was used. Data were analysed using independent t-test, paired t-test, and non-parametric Mann-Whitney U-test at p < 0.05.

RESULTS: CST showed greater improvements in Cobb angle (p=0.003), vertebral rotation (p=0.000), and SRS-22 scores (self-image and treatment satisfaction subscale scores and total score, p=0.026, p=0.037, and p=0.041, respectively) as compared to the controls. There were no significant changes in the other measures between the two groups.

CONCLUSIONS: This is the first clinical trial to investigate the effects of the 3-dimensional CST on spinal curvatures and health related quality-of-life in AIS, providing the important clinical rationale and compelling evidence for the effective management of AIS.
On-going PSSE studies

- Parent et al in Canada (NCT01610908)
- Williams et al in the UK (ISRCTN90480705)
- Abbot et al.\textsuperscript{43} in Sweden (NCT01761305) with a focus on curves, quality of life and perceived appearance.

- Preliminary results from these studies show promising findings in the short term not only on the Cobb angle but also on postural measurements and perceived appearance.\textsuperscript{44-46}
The use of exercises for the treatment of Adolescents with Idiopathic Scoliosis is controversial. Whilst exercises are routinely used in a number of central and southern European countries, most centres in the rest of the world (mainly in Anglo-Saxon countries), do not advocate its use. One of the reasons for this is that many health care professionals are usually not conversant with the differences between generalised physiotherapy exercises and physiotherapeutic scoliosis-specific exercises (PSSE): while the former are generic exercises usually consisting of low-impact stretching and strengthening activities like yoga, Pilates and the Alexander technique, PSSE consist of a program of curve-specific exercise protocols which are individually adapted to a patients’ curve site, magnitude and clinical characteristics. PSSEs are performed with the therapeutic aim of reducing the deformity and preventing its progression. It also aims to stabilise the improvements achieved with the ultimate goal of limiting the need for corrective braces or the necessity of surgery. This paper introduces the different ‘Schools’ and approaches of PSSE currently practiced (Scientific Exercise Approach to Scoliosis - SEAS, Schroth, Barcelona Scoliosis Physical Therapy School - BSPTS, Dobomed, Side Shift, Functional Individual Therapy of Scoliosis - FITS and Lyon) and discusses their commonalities and differences.

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Thank you for your attention