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Comparative Study of Schroth and SEAS Methods in Managing Adolescent Idiopathic Scoliosis: A Randomized Clinical Trial

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ABSTRACT

Background:Adolescent idiopathic scoliosis (AIS) is a common spinal deformity among adolescents. Exercise-based interventions like the Schroth and SEAS methods are increasingly used as conservative treatments to correct spinal curvature and improve quality of life.

Objective:This randomized clinical trial aims to compare the effectiveness of the Schroth method and the Scientific Exercise Approach to Scoliosis (SEAS) in reducing Cobb angle and improving pain levels in adolescents with AIS.

Methods:Sixty adolescents aged 10–18 years with Cobb angles between 20°–45° were randomly assigned to two groups: Group A (Schroth Method, n = 30) and Group B (SEAS Method, n = 30). Both groups underwent 7 weeks of supervised physiotherapy, five sessions per week. Primary and secondary outcomes—Cobb angle and pain (VAS)—were measured pre- and post-intervention. Inter-group and intra-group comparisons were analyzed using paired and independent sample t-tests.

Results:Both groups showed statistically significant improvements in Cobb angle and VAS scores ($p < 0.001$). The Schroth group had a greater mean Cobb angle reduction ($8.13° \pm 2.96$) compared to the SEAS group ($4.13° \pm 2.32$) ($p < 0.001$). Similarly, pain reduction was higher in the Schroth group (4.37 ± 1.34) than the SEAS group (2.80 ± 1.15) ($p < 0.001$).

Conclusion: While both Schroth and SEAS methods are effective for managing AIS, the Schroth method demonstrated superior outcomes in Cobb angle reduction and pain relief. These findings suggest Schroth therapy may be the more effective conservative treatment in AIS management.

Keywords: Adolescent Idiopathic Scoliosis, Schroth Method, SEAS, Cobb Angle, Randomized Clinical Trial, Conservative Management..

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1. INTRODUCTION:

1.1 Background

Adolescent idiopathic scoliosis (AIS) is a progressive, three-dimensional spinal deformity that typically manifests during periods of rapid skeletal growth, affecting 1%–3% of children between the ages of 10 and 18. Characterized by lateral curvature and axial rotation of the vertebrae, AIS can result in postural asymmetry, pain, impaired pulmonary function, and psychological distress. The severity of the curvature is commonly measured using the Cobb angle, with curves between 20°–45° classified as moderate and requiring clinical intervention.

Conventional management of AIS includes observation, bracing, and surgery, depending on the curvature's progression and the patient's skeletal maturity. However, the drawbacks of bracing (e.g., reduced mobility, psychosocial issues) and risks associated with surgical intervention (e.g., infection, loss of flexibility) have led to increased interest in conservative physiotherapeutic approaches, particularly scoliosis-specific exercise (SSE) programs.

1.2 Schroth and SEAS Methods

The Schroth Method, developed by Katharina Schroth, emphasizes three-dimensional spinal correction through rotational angular breathing (RAB), isometric strengthening, and postural re-education. It targets asymmetrical muscle activation and postural integration to reverse or stabilize curvature progression.

In contrast, the Scientific Exercise Approach to Scoliosis (SEAS), developed in Italy, focuses on active self-correction without external aids. It is grounded in neurophysiological principles and emphasizes the transfer of postural corrections into daily functional tasks. SEAS is considered more adaptable to home-based programs, though its long-term efficacy compared to Schroth remains under-researched.

1.3 Rationale for the Study

While both Schroth and SEAS have demonstrated clinical effectiveness in reducing Cobb angle and improving quality of life in AIS, direct comparisons between these two interventions are scarce. The few available studies vary in methodology, sample size, and follow-up duration, making it difficult for clinicians to determine which method offers superior outcomes for curve correction, pain relief, and function.

1.4 Objective

This study aims to:

Compare the effectiveness of Schroth and SEAS methods in reducing Cobb angle.

Evaluate improvements in pain perception using the Visual Analog Scale (VAS).

Determine which method yields superior clinical outcomes in adolescents with idiopathic scoliosis

2. Materials and Methods

2.1 Study Design

This study was a randomized, controlled clinical trial comparing two scoliosis-specific exercise interventions: the Schroth Method and the Scientific Exercise Approach to Scoliosis (SEAS). The trial followed a parallel-group design with a pre-test and post-test evaluation.

2.2 Setting and Duration

The study was conducted at the Department of Physiotherapy, Pacific Medical College and Hospital, Udaipur, India, over a period of 7 weeks, with supervised sessions five times per week.

2.3 Participants

Inclusion Criteria:

Adolescents aged 10–18 years diagnosed with idiopathic scoliosis

Cobb angle between 20° and 45°

Risser sign 0–2 (indicating skeletal immaturity)

No prior history of spinal surgery or bracing

Informed consent obtained from parents or legal guardians

Exclusion Criteria:

Age <10 or >20 years

History of spinal surgery or neurological disorders

Use of bracing, Pilates, manual therapy, or other conflicting interventions during the study

Cardiovascular, infectious, or musculoskeletal conditions that could interfere with participation

2.4 Sample Size and Randomization

A total of 60 participants were randomly assigned to two equal groups using a simple randomization technique:

Group A (n = 30): Schroth Metho

Group B (n = 30): SEAS Method

Each participant received 35 sessions (5 sessions/week for 7 weeks).

2.5 Intervention Protocol

Group A: Schroth Method

Pelvic corrections

Rotational Angular Breathing (RAB)

Isometric muscle activation and elongation exercises

Postural integration into ADLs

Tools: Therapy balls, TheraBands, wall bars, tactile feedback, mirrors

Group B: SEAS Method

Active self-correction techniques

Stabilization exercises focusing on neuromuscular control

Postural control during dynamic and functional tasks

Individualized progression based on curve type

Emphasis on home practice and minimal use of props

2.6 Outcome Measures

Primary Outcome:

Cobb Angle: Measured by standing anteroposterior radiographs before and after intervention. Changes ≥5° considered clinically significant.

Secondary Outcome:

Pain Intensity (VAS): Visual Analog Scale ranging from 0 (no pain) to 10 (worst imaginable pain), recorded pre- and post-intervention.

2.7 Statistical Analysis

Descriptive statistics (mean, standard deviation) were calculated.

Paired sample t-tests evaluated within-group pre-post changes.

Independent sample t-tests assessed between-group differences.

Significance threshold set at $p < 0.05$

Data were analyzed using SPSS version XX or Microsoft Excel (as applicable).

3. Results

3.1 Participant Characteristics

A total of 60 adolescents (aged 10–18 years) diagnosed with idiopathic scoliosis participated in the study. All participants completed the 7-week intervention. The two groups were comparable in age, baseline Cobb angle, and VAS scores at the start of the trial.

Variable	Schroth Group (n = 30)	SEAS Group (n = 30)
Mean Age (years)	14.3 ± 2.1	14.5 ± 1.9

Gender (F:M)	19:11	18:12
Baseline Cobb (°)	27.17 ± 6.80	25.63 ± 6.24
Baseline VAS	7.03 ± 1.20	6.67 ± 1.40

3.2 Intra-Group Analysis

Schroth Group (Group A)

Measure	Pre-Intervention	Post-Intervention	Mean Change	p-value
Cobb Angle (°)	27.17 ± 6.80	19.03 ± 6.41	–8.13 ± 2.96	< 0.001
VAS Score	7.03 ± 1.20	2.67 ± 1.18	–4.37 ± 1.34	< 0.001

SEAS Group (Group B)

Measure	Pre-Intervention	Post-Intervention	Mean Change	p-value
Cobb Angle (°)	25.63 ± 6.24	21.50 ± 5.65	–4.13 ± 2.32	< 0.001
VAS Score	6.67 ± 1.40	3.87 ± 1.11	–2.80 ± 1.15	< 0.001

3.3 Inter-Group Comparison

Outcome Measure	Schroth (Mean ± SD)	SEAS (Mean ± SD)	t-value	p-value
Cobb Angle Change	8.13 ± 2.96	4.13 ± 2.32	5.87	< 0.001
VAS Score Change	4.37 ± 1.34	2.80 ± 1.15	5.28	< 0.001

3.4 Graphical Summary (Optional for Manuscript)

Bar graphs illustrated significant reductions in Cobb angle and VAS scores in both groups.

Box plots revealed a larger range of Cobb angle reduction in the Schroth group compared to SEAS.

3.5 Compliance and Adverse Events

Adherence: 100% of participants completed ≥90% of sessions.

No adverse events or complications were reported in either group.

4. **Discussion**

This randomized clinical trial aimed to compare the effectiveness of the Schroth Method and SEAS in reducing spinal curvature and pain in adolescents with idiopathic scoliosis. The findings confirm that both interventions produced statistically significant improvements, with the Schroth Method demonstrating superior outcomes in both Cobb angle reduction and pain relief.

4.1 Interpretation of Results

The Schroth group achieved a mean Cobb angle reduction of 8.13°, which exceeded the clinically significant threshold of

5°. In contrast, the SEAS group showed a mean reduction of 4.13°, which, while statistically significant ($p < 0.001$), may fall short of long-term clinical relevance in some cases.

Similarly, pain measured via the Visual Analog Scale (VAS) decreased more substantially in the Schroth group (4.37 points) compared to the SEAS group (2.80 points). This suggests that the Schroth Method may offer better symptomatic relief, possibly due to its emphasis on rotational breathing, muscular symmetry, and direct postural correction.

4.2 Comparison with Previous Studies

These results are in line with findings from Schreiber et al. (2016) and Ceballos-Laita et al. (2023), which reported greater effectiveness of Schroth over other conservative therapies in AIS. Studies evaluating SEAS also report improvements in spinal alignment and function (e.g., Romano et al., 2015), but often highlight the need for patient motivation and longer-term engagement for optimal results.

The higher improvement in the Schroth group may be attributed to its structured, therapist-supervised, and feedback-driven sessions, whereas SEAS places greater emphasis on self-correction and home-based strategies, which may vary in execution quality among adolescents.

4.3 Clinical Implications

Given the non-invasive nature, high compliance, and absence of adverse events, both methods appear safe and effective as conservative interventions. However, Schroth may be particularly beneficial for patients:

With moderate curves approaching surgical thresholds.

Experiencing significant pain or postural issues.

Requiring therapist-guided, intensive intervention.

4.4 Limitations

Short-term duration (7 weeks); long-term outcomes were not assessed

No blinding of participants or therapists.

Subjective measures (e.g., pain, postural quality) may carry bias.

Single-center study, limiting external generalizability.

4.5 Recommendations for Future Research

Include long-term follow-up to assess curve stabilization.

Use 3D motion analysis and validated quality-of-life scales.

Consider multi-center trials with larger, more diverse samples

Explore hybrid approaches combining both methods.

5. Conclusion

This randomized clinical trial demonstrates that both the Schroth and SEAS methods are effective in managing adolescent idiopathic scoliosis (AIS), resulting in significant reductions in Cobb angle and pain intensity. However, the Schroth Method yielded significantly superior results, with greater curve correction and pain relief over a 7-week period.

These findings suggest that Schroth-based physiotherapy may offer a more effective conservative treatment option for adolescents with moderate scoliosis, particularly when early, structured intervention is prioritized. Nonetheless, the SEAS method remains a valuable and accessible alternative, especially in settings emphasizing self-management and home-based care.

Further longitudinal studies are recommended to explore the long-term sustainability of these improvements and the potential benefits of integrating both approaches

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