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Therapeutic exercises for idiopathic scoliosis in adolescents

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Abstract

Background: Adolescent idiopathic scoliosis (AIS) is a pathology that changes the three-dimensional shape of the spine and trunk. While AIS can progress during growth and cause cosmetic issues, it is usually asymptomatic. However, a final spinal curvature above the critical threshold of 30° increases the risk of health problems and curve progression in adulthood. The use of therapeutic exercises (TEs) to reduce the progression of AIS and delay or avoid other, more invasive treatments is still controversial.

Objectives: To evaluate the effectiveness of TE, including generic therapeutic exercises (GTE) and physiotherapeutic scoliosis-specific exercises (PSSE) in treating AIS, compared to no treatment, other non-surgical treatments, or between treatments.

Search methods: We searched CENTRAL, MEDLINE, Embase, four other databases, and two clinical trials registers to 17 November 2022. We also screened reference lists of articles.

Selection criteria: Randomised controlled trials (RCTs) comparing TE with no treatment, other non-surgical treatments (braces, electrical stimulation, manual therapy), and different types of exercises. In the previous version of the review, we also included observational studies. We did not include observational studies in this update since we found sufficient RCTs to address our study aims.

Data collection and analysis: We used standard Cochrane methodology. Our major outcomes were progression of scoliosis (measured by Cobb angle, trunk rotation, progression, bracing, surgery), cosmetic issues (measured by surface measurements and perception), and quality of life (QoL). Our minor outcomes were back pain, mental health, and adverse effects.

Main results: We included 13 RCTs (583 participants). The percentage of females ranged from 50% to 100%; mean age ranged from 12 to 15 years. Studies included participants with Cobb angles from low to severe. We judged 61% of the studies at low risk for random sequence generation and 46% at low risk for allocation concealment. None of the studies could blind participants and personnel. We judged the subjective outcomes at high risk of performance and detection bias, and the objective outcomes at high risk of detection bias in six studies and at low risk of bias in the other six studies. One study did not assess any objective outcomes. Comparing TE versus no treatment, we are very uncertain whether TE reduces the Cobb angle (mean difference (MD) -3.6°, 95% confidence interval (CI) -5.6 to -1.7; 2 studies, 52 participants). Low-certainty evidence indicates PSSE makes little or no difference in the angle of trunk rotation (ATR) (MD -0.8°, 95% CI -3.8 to 2.1; 1 study, 45 participants), may reduce the waist asymmetry slightly (MD -0.5 cm, 95% CI -0.8 to -0.3; 1 study, 45 participants), and may result in little to no difference in the score of cosmetic issues measured by the Spinal Appearance Questionnaire (SAQ) General (MD 0.7 points, 95% CI -0.1 to 1.4; 1 study, 16 participants). PSSE may result in little to no difference in self-image measured by the Scoliosis Research Society - 22 Patient Questionnaire (SRS-22) (MD 0.3 points, 95% CI -0.3 to 0.9; 1 study, 16 participants) and improve QoL slightly measured by SRS-22 Total score (MD 0.3 points, 95% CI 0.1 to 0.4; 2 studies, 61 participants). Only Cobb angle results were clinically meaningful. Comparing PSSE plus bracing versus

bracing, low-certainty evidence indicates PSSE plus bracing may reduce Cobb angle (-2.2° , 95% CI -3.8 to -0.7 ; 2 studies, 84 participants). Comparing GTE plus other non-surgical interventions versus other non-surgical interventions, low-certainty evidence indicates GTE plus other non-surgical interventions may reduce Cobb angle (MD -8.0° , 95% CI -11.5 to -4.5 ; 1 study, 80 participants). We are uncertain whether PSSE plus other non-surgical interventions versus other non-surgical interventions reduces Cobb angle (MD -7.8° , 95% CI -12.5 to -3.1 ; 1 study, 18 participants) and ATR (MD -8.0° , 95% CI -12.7 to -3.3 ; 1 study, 18 participants). PSSE plus bracing versus bracing alone may make little to no difference in subjective measurement of cosmetic issues as measured by SAQ General (-0.2 points, 95% CI -0.9 to 0.5 ; 1 study, 34 participants), self-image score as measured by SRS-22 Self-Image (MD 0.1 points, 95% CI -0.3 to 0.5 ; 1 study, 34 participants), and QoL measured by SRS-22 Total score (MD 0.2 points, 95% CI -0.1 to 0.5 ; 1 study, 34 participants). None of these results were clinically meaningful. Comparing TE versus bracing, we are very uncertain whether PSSE allows progression of Cobb angle (MD 2.7° , 95% CI 0.3 to 5.0 ; 1 study, 60 participants), changes self-image measured by SRS-22 Self-Image (MD 0.1 points, 95% CI -1.0 to 1.1 ; 1 study, 60 participants), and QoL measured by SRS-22 Total score (MD 3.2 points, 95% CI 2.1 to 4.2 ; 1 study, 60 participants). None of these results were clinically meaningful. Comparing PSSE with GTE, we are uncertain whether PSSE makes little or no difference in Cobb angle (MD -3.0° , 95% CI -8.2 to 2.1 ; 4 studies, 192 participants; very low-certainty evidence). PSSE probably reduces ATR (clinically meaningful) ($-MD 3.0^\circ$, 95% CI -3.4 to -2.5 ; 2 studies, 138 participants). We are uncertain about the effect of PSSE on QoL measured by SRS-22 Total score (MD 0.26 points, 95% CI 0.11 to 0.62 ; 3 studies, 168 participants) and on self-image measured by SRS-22 Self-Image and Walter Reed Visual Assessment Scale (standardised mean difference (SMD) 0.77, 95% CI -0.61 to 2.14 ; 3 studies, 168 participants). Further, low-certainty evidence indicates that 38/100 people receiving GTE may progress more than 5° Cobb versus 7/100 receiving PSSE (risk ratio (RR) 0.19, 95% CI 0.67 to 0.52 ; 1 study, 110 participants). None of the included studies assessed adverse effects.

Authors' conclusions: The evidence on the efficacy of TE is currently sparse due to heterogeneity, small sample size, and many different comparisons. We found only one study following participants to the end of growth showing the efficacy of PSSE over TE. This result was weakened by adding studies with short-term results and unclear preparation of treating physiotherapists. More RCTs are needed to strengthen the current evidence and study other highly clinically relevant outcomes such as QoL, psychological and cosmetic issues, and back pain.

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