Physical exercises as a treatment for adolescent idiopathic scoliosis: a systematic review
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CRD summary
This review concluded that there was no solid evidence for or against the effectiveness of physical exercises in reducing curve progression in adolescent idiopathic scoliosis. The review's main limitation appeared to be the poor quality of the included studies. In view of this, the conclusion seems appropriate.

Authors' objectives
To assess the effectiveness of physical exercises for treating adolescent idiopathic scoliosis.

Searching
MEDLINE, EMBASE, CINAHL and the Cochrane Library were searched from inception until 2002, with no language restrictions; the search terms were reported. The authors also examined the reference lists of retrieved papers. The following journals were searched by hand: Annales de Kinesitherapie (1978 to 2002), Kinesitherapie Scientifique (1978 to 2002), Resonances Europeenes Du Rachis (1994 to 2002), Cahiers de Kinesitherapie (1978 to 1997), Ginnastica Medica, Medicina Fisica e Riabilitazione (1953 to 2002), Chinesiologia Scientifica (1978 to 2002), Atti Gis, Giornate di Patologia Vertebrale (1978 to 2002), European Medical Physiology (1978 to 2002) and European Spine Journal (1989 to 2002).

Study selection
Study designs of evaluations included in the review
All study designs were eligible for inclusion in the review.

Specific interventions included in the review
Studies of physical exercise treatment were eligible for inclusion, provided that this was the only treatment received by the patients. The specific exercises used in the included studies were the Milwaukee method, Schroth method and Lyon method, side shift therapy and the MedX rotary torso machine. One trial used a combination of unspecified methods. Across the trials the exercises had a variety of aims, such as mobilisation, strengthening, straightening, posture control and correction, side shift, auto-correction and balance. Controlled studies generally had untreated control groups, although one study compared physical exercises with bracing.

Participants included in the review
Studies of patients with a diagnosis of adolescent idiopathic scoliosis were eligible for inclusion. The average degree of curvature (Cobb angle) in the included studies ranged from 10 to 43 degrees. The average patient age, where reported, generally varied from 10 to 13.6 years. The exception was one study with an average age of 21.6 years.

Outcomes assessed in the review
Studies in which the Cobb angle was measured were eligible for inclusion. The included studies measured changes in the magnitude of the Cobb angle, and also assessed progression (worsening) and reduction (improvement) of spinal curvature. Progression and reduction were generally defined as a change in the Cobb angle of more than a certain value.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
Validity was assessed using the following criteria: the use of a control group, allocation to groups (random or by other methods), prospective or retrospective design, sample size, description of recruitment, patient characteristics and intervention, blinding of the outcome assessment, and the identification of and statistical control for potential
confounding factors. The authors did not state how the papers were assessed for validity, or how many reviewers performed the validity assessment.

**Data extraction**
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. For each study, the reviewers extracted the average Cobb angles of the intervention and control groups at baseline and after treatment, and the percentage of patients in each group whose spinal curvature had reduced, remained unchanged, or progressed.

**Methods of synthesis**
- **How were the studies combined?**
  Details of the studies were presented in tables and figures, and each study was discussed separately in a narrative.

- **How were differences between studies investigated?**
  Controlled and uncontrolled studies were discussed in separate sections in the text, but their results were presented together in the tables and figures.

**Results of the review**
The review included 11 studies with a total of 1,783 patients. Six of the studies were controlled, but only one was a prospective study with concurrent controls (196 patients). There were also 5 uncontrolled studies (377 patients).

The quality of the primary studies was generally poor. No studies were randomised or used a blinded outcome assessment, few reported the methods of recruitment or allocation to treatment groups, and few attempted to identify or control for potential confounders.

The authors stated that, with one exception, the published studies demonstrated the efficacy of physical exercises in reducing both the rate of progression and the magnitude of the Cobb angle at the end of treatment. However, the results of a statistical test were not reported and it was unclear how many of the apparent treatment differences in favour of exercise were significant.

**Authors' conclusions**
The poor quality of the studies meant that there was a lack of solid evidence for or against the effectiveness of physical exercises for reducing curve progression in adolescent idiopathic scoliosis.

**CRD commentary**
The review question was clearly defined in terms of the participants and outcomes, but the inclusion criterion for the intervention was somewhat vague. Several electronic databases were searched for studies, and the search terms and dates were reported. There were no language restrictions in the electronic search, whereas journals in three languages were searched by hand. However, some foreign language papers could not be obtained in full text and, therefore, were excluded without being assessed for relevance. No attempts were made to locate unpublished research, which might have resulted in publication bias. The potential impact of publication and language bias on the review was not considered. Since the methods used to select the studies, assess validity and extract the data were not reported, it was unclear whether any steps were taken to minimise reviewer errors and bias.

Some relevant study details were presented in the review, as were the results of the validity assessment. The use of a narrative summary was appropriate given the heterogeneity in patient characteristics, interventions, length of follow-up and study designs. The results, however, were not synthesised and insufficient information, particularly about the statistical significance of individual treatment differences, was reported. The authors' conclusion seems appropriate in view of the poor quality of the included studies.
Implications of the review for practice and research
Practice: The authors stated that until better quality research evidence becomes available, the option of physical exercise treatment should be presented to patients and their families, and that patient preferences can be used to determine treatment.

Research: The authors stated that further research on physical exercise treatment of adolescent idiopathic scoliosis is required. They recommended that prospective randomised controlled trials with adequate power should be carried out.

Bibliographic details

PubMedID
14713590

DOI
10.1080/13638490310001636781

Indexing Status
Subject indexing assigned by NLM

MeSH
Adolescent; Exercise; Exercise Therapy; Humans; Physical Therapy Modalities /statistics & numerical data; Scoliosis /rehabilitation /therapy

AccessionNumber
12004009194

Date bibliographic record published
31/12/2005

Date abstract record published
31/12/2005

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.