Therapeutic effects of yoga for children: a systematic review of the literature

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CRD summary
The authors concluded that the evidence suggested physiological benefits of yoga for the paediatric population may bring benefit through the rehabilitation process, but further research was needed. The reliability of the authors' cautious conclusions are uncertain due to lack of reporting of results, variability between studies and overall poor quality of the included trials.

Authors' objectives
To assess the therapeutic effects of yoga for a paediatric population.

Searching
MEDLINE, EMBASE, CINAHL, PsycINFO, PEDro, and Cochrane Central Register of Controlled Trials (CENTRAL) were searched to January 2007. Search terms were reported. The yoga register of the Cochrane Breast Cancer Group was screened.

Study selection
Randomised controlled trials, cohort studies, case-control studies and pilot studies that evaluated yoga (combination of breathing exercises, physical posture and meditation) as an exercise intervention in a paediatric population were eligible for inclusion. Studies that included an additional treatment arm or combined intervention were included only if the effects of exercise could be isolated. Included studies had to include a paediatric population described as developing normally or with various impairments of muscular, cardiopulmonary or neuromuscular systems. To be included in the review, studies had to report results on the primary outcomes of quality of life (QoL), cardiorespiratory fitness or physical functioning. Secondary outcomes included cognition, attention and adverse events.

Studies that evaluated various schools of yoga exercise were included either alone or in combination with additional exercise (details reported in the review). Comparison groups included placebo, controlled comparison and standard care. The population in the included studies included children, adolescents and adults. The age range, where reported, was from four years to 78 years and included healthy participants as well as those diagnosed with asthma or attention deficit hyperactivity disorder (ADHD), attention problems or who experienced anxiety or depression or social adjustment difficulties. Some participants were taking concomitant medications or other therapies.

Three reviewers independently screened studies for inclusion.

Assessment of study quality
Validity was assessed using published criteria that included assessment of concealment of allocation, method of randomisation, blinding of outcome assessor, description and rate of withdrawals, reporting of an intention-to-treat (ITT) analysis and adherence to intervention. Level of evidence was scored according to criteria defined by Sackett et al. (2000). Studies were categorised as high quality if they met four or more of the validity criteria.

The authors stated neither how the validity assessment was performed nor how many reviewers performed the assessment.

Data extraction
Three reviewers independently extracted data onto a standardised form. Disagreements were resolved through discussion.

Methods of synthesis
Studies were grouped by outcome and combined in a narrative synthesis. Additional data was reported in tables.

Results of the review
Twenty four studies (n=1,897, range 9 to 570) were included in the review. Five studies were classified as level 4, four
as level 3, 15 as level 2 and none as level 1 grade of evidence; studies were assessed as being of moderate to low quality. The description of randomisation was clear for all studies. Few studies reported the method of blinding. No information was reported on intention-to-treat analysis and withdrawals.

Neuromuscular effects of yoga (10 studies): After a yoga intervention, improvements were reported for paediatric participants with ADHD in several measurement scales (one study). Yoga was described as a promising therapy for children with ADHD when delivered via a family treatment approach and used with existing treatment (one study). Improvements on time spent on a task were reported for paediatric participants with attention problems (one study). Improvements for recall of spatial information were reported (one study). Improvements in IQ and social adaptation for paediatric participants with learning difficulties were reported (one study).

Improvements were reported after healthy paediatric participants had participated in a yoga intervention for sensory-motor performance and enhanced processing after yoga sessions (one study), planning and execution time for simple and complex tasks (one study), motor performance (one study), memory (two studies), and in motor speed for repetitive finger movements, but not in strength or endurance for healthy paediatric and adults (one study).

Cardiopulmonary effects (10 studies): Yoga was associated with improvements in a paediatric population with a history of asthma for forced expiratory volume and overall physical fitness (one study) and weekly number of asthma attacks, scores for drug treatment and peak flow rate compared to control in a mixed adult and paediatric population (one study).

A positive correlation was reported between yoga and cardiopulmonary improvements for paediatric and adult asthmatic participants (one study). Regularity of practice of yoga was found to be the strongest predictor of improved peak expiratory flow and decreased use of medication for adult and paediatric asthmatic participants (one study).

Yoga was reported to have reduced levels of fear and anxiety for socially or emotionally traumatized adolescent girls (one study), reduced respiration rates in visually impaired adolescents with normal cardiac function but increased levels of anxiety (1 study) and reduced fears and feelings of helplessness in adolescents with abnormal examination anxiety (one study).

Hospitalised children and adolescents with a diagnosis of an adjustment disorder and depression appeared to benefit from the yoga (one study). Yoga interventions in healthy populations of children and adolescents was associated with improvements in self image (one study) and ventricular performance (one study).

Musculoskeletal effects of yoga (four studies): Yoga improved physiological function, overall health and performance in a population of adolescent girls who had difficulty adjusting to home, school or society (one study) as well as healthy children and adolescents (three studies).

Authors' conclusions
Evidence suggested that physiological benefits of yoga for the paediatric population may bring benefit through the rehabilitation process. Larger clinical trials that included specific measures of quality of life were necessary to provide definitive evidence.

CRD commentary
The review question was clear in terms of study design, intervention, population and outcomes. Several relevant sources were searched, but no efforts were made to locate unpublished studies and this raised the possibility of publication bias. It appeared that no language restrictions were applied. Appropriate methods were used to minimise reviewer errors and bias in the selection of studies and extraction of data, but it was unclear whether similar steps were taken in assessment of validity.

Study validity was assessed using appropriate criteria and results of assessment were reported briefly. A narrative synthesis was appropriate due to the differences between studies in terms of interventions, participants, outcomes and study designs. However, results for individual studies were reported without supporting data or levels of statistical significance, so it is not possible for the reader to verify the results. A number of studies included a mixed population of paediatric and adult participants, and it was not possible to separate out the treatment effects for a paediatric population alone. The authors appropriately reported limitations of the review, which included small sample sizes,
differences between studies and overall poor quality of the included studies. The reliability of the authors' cautious conclusions are uncertain due to lack of reporting of results and variability between studies and the overall poor quality of the studies.

Implications of the review for practice and research

**Practice:** The authors stated that physical therapists can consider yoga as a modality for musculoskeletal, neuromuscular and cardiopulmonary problems, as well as a holistic approach to the mind-body of children.

**Research:** The authors stated that further large methodologically rigorous trials were needed to evaluate different yoga regimens to understand the role of yoga and how it impacts on the developing child and QoL. In future trials, the intervention should be reported in detail (frequency, intensity, time and type of exercise) to evaluate exercise dose-response. Adherence to an intervention should be reported, as well as monitoring of activity in comparison groups to assess potential contamination. Future studies should also monitor and report the incidence of and potential for adverse events.

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