The effect of physical training in children with asthma on pulmonary function, aerobic capacity and health-related quality of life: a systematic review of randomized control trials

Crosbie A

CRD summary
This review concluded that physical training did not improve pulmonary function, in children with asthma, but did increase their aerobic capacity; research was needed to confirm a benefit in quality of life. These conclusions reflect the evidence presented, but may be somewhat strong, given the lack of statistical synthesis, unclear presentation of the results, and potential for error and bias.

Authors' objectives
To assess the effectiveness of physical therapy, to improve pulmonary function and aerobic capacity, in children with asthma.

Searching
MEDLINE, EMBASE, SPORTDiscus, AMED, CINAHL and Cochrane Central Register of Controlled Trials (CENTRAL) were searched, using specified search terms, up to September 2011. The search was limited to randomised controlled trials, published in English. Reference lists of included articles were searched.

Study selection
Randomised controlled trials of children (aged six to 18 years), who were diagnosed with asthma of any severity, were eligible for inclusion if they compared any exercise intervention, lasting at least four weeks, with a control of usual care. Trials in which the intervention was only one exercise session, or breathing or relaxation techniques, were excluded, as were those in which the control group was prescribed medication or physical therapy and the treatment group was not.

In the included trials, the mean age of the children was 10.6 years (where reported) and most had mild-to-moderately severe asthma; two trials included children with severe asthma. Common outcomes were the forced vital capacity, the forced expiratory volume in one second as a percentage of predicted (FEV1%), the maximum volume of oxygen (VO_{2max}), and health-related quality of life, measured by the Paediatric Asthma Quality of Life Questionnaire. The exercise interventions took place over six to 12 weeks; most trials provided two to three sessions, of 15 to 90 minutes, each week. Swimming was the most common type of exercise; basketball, running, cycling and other aerobic exercises and games were used. Most of the control groups received no additional intervention beyond their unspecified usual care.

The sole author screened and selected studies for inclusion.

Assessment of study quality
A modified Delphi list was used, by the author, to assess the adequacy of randomisation, outcome measures, handling of drop-outs and blinding, with the addition of a criterion for the supervision of exercise sessions. There were 12 criteria that could be met.

Data extraction
The data were extracted from each trial, by the author. The mean percentage change and standard deviations for each outcome were extracted. Where these were not provided, the author calculated the mean values using the baseline and final values, as reported in the original papers.

Methods of synthesis
Trial results were grouped according to the outcomes reported (pulmonary function, aerobic fitness, and quality of life), and a narrative synthesis of the data was presented in the text, with data in tables.

Results of the review
A total of 16 trials were included, with 516 participants (253 in the control groups and 263 taking part in exercise). The overall quality was judged to be moderate, with trials meeting 4 to 9 of the criteria. The most common problems were poor reporting of compliance and drop-outs, lack of allocation concealment, and concerns about the analysis. Three trials blinded the outcome assessors. Four trials did not provide enough information on the intervention for it to be replicated.

**Pulmonary function:** Only one of 11 trials reported a significant change in FEV1%, the remainder found no significant change in any measure of pulmonary function, after an exercise intervention, compared with control.

**Aerobic capacity:** Seven of nine trials reported statistically significant improvements in VO$_{2\text{max}}$ for the exercise group, compared with control. One trial reported a significant improvement based on exercise workload as a measure of aerobic fitness, and one trial did not find a significant difference in VO$_{2\text{max}}$ between exercise and control.

**Quality of Life:** Six trials assessed quality of life. All three trials that used the Paediatric Asthma Quality of Life Questionnaire reported significant improvements, following an exercise intervention, compared with control. The other three trials reported a range of outcomes including the number of wheezy days, hospitalisations, asthma attacks, and absent school days; most were improved significantly with the intervention.

**Authors’ conclusions**
Physical training did not improve pulmonary function in children with asthma, but did increase their aerobic capacity. Well-designed trials were needed to verify if physical training improved health-related quality of life.

**CRD commentary**
The review addressed a clear question, with reasonable inclusion criteria. The searches were reasonably broad, but the exclusion of trials based on publication status and language may have omitted relevant data. Only one reviewer was involved throughout, therefore standard processes to reduce the potential for reviewer error and bias were not used.

The included trials were assessed for methodological quality, but the results were not used in the synthesis. Trial characteristics were presented, and it was unclear why a statistical synthesis was not considered. The narrative synthesis seemed to use vote counting of statistically significant results for each trial individually. Many of the included trials were relatively small, so it is possible that they were under-powered to detect any real differences in pulmonary function.

The conclusions drawn reflect the evidence presented, but they may be somewhat strong, given the lack of statistical pooling, unclear presentation of the results, and the potential for error and bias.

**Implications of the review for practice and research**

**Practice:** The author made no recommendations for practice.

**Research:** The author stated that well-designed randomised controlled trials were needed to examine the impact of physical exercise on health-related quality of life, in children with asthma. Research should establish the optimal training intensity for asthmatic patients, and explore whether physical therapy could offset their decline in lung function.

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