Can exercise influence low bone mineral density in children with juvenile rheumatoid arthritis?

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CRD summary
This review assessed the effectiveness of weight-bearing exercise in reducing the risk of low bone mineral density in children with juvenile rheumatoid arthritis, concluding that low-impact exercise programmes were safe, but that further research was required. Given several limitations, including heterogeneity among studies, and the quality of reporting in the review, the authors' conclusions regarding safety may not be reliable.

Authors' objectives
To assess the effectiveness of weight-bearing exercise in reducing the risk of low bone mineral density (BMD) in children with juvenile rheumatoid arthritis.

Searching
PubMed, CINHAL, PEDro, Cochrane Database of Systematic Reviews and the Cochrane Database of Effectiveness Trials were searched from 1990 for articles published in English or with an English translation. References of articles were also searched. Search terms were reported.

Study selection
Randomised controlled trials (RCTs) and cohort studies assessing the safety and effects of weight-bearing and physical activity on BMD in children with juvenile idiopathic arthritis (JIA) were eligible for inclusion in the review; where healthy children alone were the subject, only RCTs were eligible. Cohort and case-series studies evaluating factors associated with low BMD and children with JIA were also eligible. Narrative reviews and expert opinions were excluded.

Included studies reporting JIA type were of patients with oligoarticular, polyarticular or systemic JIA. Some patients had received previous medication. Most of the studies included controls. Some studies were of adults rather than children. Bone mineral content (BMC) and BMD were measured using a number of different measurement tools, but the majority of studies reporting this data used dual-energy x-ray absorptiometry (DEXA). Studies assessing weight-bearing interventions in healthy children reported ground reaction force (GRF) produced during the activity. The most commonly reported outcomes were BMC changes at the femoral neck and lumbar spine. For studies reporting treatment regimens, the majority administered treatment three times a week for between three and 20 months.

Two reviewers assessed articles for relevance, with any disagreements resolved by consensus.

Assessment of study quality
Two reviewers used the PEDro Scale for RCTs, non-RCTs and case series to assess the quality of included studies. Any discrepancies were resolved by consensus.

Data extraction
Mean changes in BMD were extracted for healthy children, and descriptive results were extracted for outcomes reported in children with JIA. It was a little unclear how many reviewers performed the data extraction, but it appears that one author may have extracted the data and two other authors checked the data.

Methods of synthesis
Data on the effects of weight-bearing and physical activity programmes for healthy children and children with JIA were presented as a narrative synthesis and in tables. In addition, effect sizes for exercise in healthy children compared to controls were reported by the site at which bone density was calculated (lumbar or femoral spine).

Results of the review

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Nine studies comprising eight RCTs and one prospective cohort study (n=607) were included in the review. Sample sizes ranged between 25 and 144 patients. Studies scored between four and nine on the PEDro rating scale.

Seven studies (n=528) assessing weight bearing interventions with healthy children reported effect sizes (change in BMC) ranging between zero and 1.38; the largest treatment effect was reported by two high-impact studies.

One study (n=25) reported significant improvements in children with polyarticular JIA after low impact weight-bearing exercise. Another study (n=54) reported a non-significant statistical difference between intervention and control groups after aquatic therapy.

Factors associated with low BMD and children with JIA were also reported in the review (29 studies).

**Authors’ conclusions**
Low-impact exercise programmes have been shown to be safe and should be included as part of exercise regimens for individuals with JIA, but further research is required to identify the optimal regimen to reduce risk for low BMD.

**CRD commentary**
The objectives of the review were clear and were supported by appropriate inclusion criteria for patients, interventions and study design. A reasonable literature search was carried out, but the searches were limited by publication date, restricted by language and did not appear to seek out unpublished papers, so language and publication bias cannot be ruled out. Validity was assessed using a previously published scale. Although attempts were made to minimise reviewer error and bias for study selection and data extraction, it was a unclear whether the same was true for validity assessment. Considering the clinical and methodological heterogeneity among studies, a narrative synthesis was appropriate. However, sample sizes and effect sizes were generally small, and the reporting in the review was not always clear, including slight inconsistencies in the conclusions reported in the abstract and review. Some of the studies reported did not appear to meet the inclusion criteria, some included adults and one study was not identified as an included study. Given the above limitations, and the fact that conclusions regarding efficacy could not be drawn, the authors’ conclusions that weight-bearing exercises are safe may not be reliable. However, their recommendation for further research appears reasonable.

**Implications of the review for practice and research**
Practice: the authors stated that clinicians needed to be aware of the factors that increased the risk of low BMD in children with JIA.

Research: the authors stated that further research was required to identify the optimal physical activity and weight-bearing forces to reduce the risk of low BMD in children with JIA, including assessing the efficacy of less intense but more frequent activity programmes. Further research was also required to address whether low impact exercise programmes provided sufficient ground reaction force (GRF) and whether existing studies should be replicated in large populations. The authors also stated that pilot/preliminary studies are needed to assess the safety and efficacy of using low-intensity daily jumping programmes to reduce the risk of low BMD in prepubescent children with JIA.

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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.