A systematic review on the effects of exercise programmes designed to improve strength for people with Down syndrome

Shields N, Dodd K

CRD summary
The authors concluded that strength training programmes can be beneficial in people with Down syndrome, although no conclusion could be drawn about the optimal programme type or safety issues. This was a well-conducted review but, given the small number of studies with variable focus, the authors' cautious interpretation of the findings is justified.

Authors' objectives
To evaluate the effectiveness and safety of strength training programmes for people with Down syndrome.

Searching
MEDLINE, EMBASE, DARE, PsycINFO, SPORTDiscus, Aussport Med, ERIC, CINAHL, PEDro, PubMed, the Cochrane Controlled Trials Register and the Cochrane Database of Systematic Reviews were searched from inception for articles published in English; the search terms were reported. Reference lists of identified trials and reviews were screened for additional studies.

Study selection
Eligible studies were all those assessing strength-based exercise programmes for people of any age diagnosed with Down syndrome, and focusing on changes in impairment (e.g. muscle strength), activity (e.g. walking and sit to stand) or societal participation (e.g. employment) according to the International Classification of Functioning, Disability and Health. Excluded from the review were Down syndrome participants with multiple diagnoses, studies with ratings less than 3 on the PEDro scale (see Validity Assessment), and studies where the population with Down syndrome represented less than 50% of the total. The majority of included participants were males aged from 13 to 65 years with an Intelligence Quotient score ranging from 32 to 75 (mild to severe intellectual impairment). The interventions targeted different muscle groups and included treadmill walking, weight resistance, or isometric and isotonic exercise programmes delivered over 6 to 25 weeks in a group or individual setting.

Two reviewers independently assessed articles for inclusion in the review. Any disagreements were resolved by consensus.

Assessment of study quality
Study quality was assessed using the PEDro scale, with the potential rating ranging from 0 to 10.

Two independent reviewers assessed quality and any disagreements were resolved by consensus.

Data extraction
The data were extracted using a standardised form. Data were collected on pre- and post-treatment means and the standard deviation for each outcome in order to calculate the effect size and 95% confidence interval (CI). Adverse effects were also investigated.

Two independent reviewers extracted the data.

Methods of synthesis
The results were combined in a narrative.

Results of the review
Three studies were included in the review: one randomised controlled trial (n=6), and two pre-test post-test clinical
trials (n=40).

The median PEDro score for quality was 4 out of 10 (range: 3 to 5).

Three studies assessed impairment. Significant increases in strength were noted in studies focusing on progressive resistance programmes, in a circuit strength training programme without the use of weights, and in a 25-week treadmill walking programme. Effect sizes ranged from 3.08 (95% CI: 2.16, 4.00) to 7.52 (95% CI: 6.46, 8.58) for the progressive resistance programmes, from 1.94 (95% CI: 1.02, 2.86) to 5.06 (95% CI: 4.14, 5.98) for the circuit strength training programme, and from 2.68 (95% CI: 1.62, 3.73) to 11.20 (95% CI: 10.48, 11.92) for the treadmill walking programme.

Comparisons of strength changes between different programmes favoured progressive resistance programmes over circuit training. There were no reported adverse effects.

One study assessed activity. Large effect sizes were reported for the 25-week treadmill walking programme in terms of improved walking speed (2.95, 95% CI: 2.42, 3.48), distance (4.67, 95% CI: 4.14, 5.20) and duration (3.98, 95% CI: 3.45, 4.51) from baseline. Compared with a non-intervention control group, the timed sit up-and-go test produced a favourable performance in the treatment group (effect size 1.03, 95% CI: 0.19, 1.87).

There was no measurement of participation restriction in any of the included studies.

**Authors' conclusions**
Strength-based exercise programmes can be beneficial for people with Down syndrome, although no conclusion could be drawn about the optimal programme type.

**CRD commentary**
The review addressed a clear research question and was supported by well-defined inclusion criteria for all aspects apart from study design. The search strategy was comprehensive, but restrictions to articles published in English may mean that relevant studies were missed and publication and language biases cannot be ruled out. The authors conducted the review process with transparency, thus minimising the potential for error and bias. The narrative synthesis was appropriate given the differences between the studies. Although a formal validity assessment was carried out, the criteria were not relevant to all studies, which means that the true quality of this limited evidence base cannot be verified. Together with the fact that the review included only a small number of small-sized, heterogeneous and largely uncontrolled studies, this suggests that the authors' cautious interpretation of the results is justified.

**Implications of the review for practice and research**
Practice: The authors stated that, given the paucity of information on potential adverse events, clinicians should adopt a cautious approach to recommending strength-training exercise programmes in the Down syndrome population.

Research: The authors stated that future high-quality randomised controlled trials should address outcomes related to functional abilities within society, and increase the focus on females with Down syndrome.

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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.