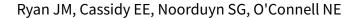


Cochrane Database of Systematic Reviews

Exercise interventions for cerebral palsy (Review)



Ryan JM, Cassidy EE, Noorduyn SG, O'Connell NE. Exercise interventions for cerebral palsy.

Cochrane Database of Systematic Reviews 2017, Issue 6. Art. No.: CD011660. DOI: 10.1002/14651858.CD011660.pub2.

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[Intervention Review]

Exercise interventions for cerebral palsy

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Editorial group: Cochrane Developmental, Psychosocial and Learning Problems Group.

Publication status and date: New, published in Issue 6, 2017.

Citation: Ryan JM, Cassidy EE, Noorduyn SG, O'Connell NE. Exercise interventions for cerebral palsy. *Cochrane Database of Systematic Reviews* 2017, Issue 6. Art. No.: CD011660. DOI: 10.1002/14651858.CD011660.pub2.

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ABSTRACT

Background

Cerebral palsy (CP) is a neurodevelopmental disorder resulting from an injury to the developing brain. It is the most common form of childhood disability with prevalence rates of between 1.5 and 3.8 per 1000 births reported worldwide. The primary impairments associated with CP include reduced muscle strength and reduced cardiorespiratory fitness, resulting in difficulties performing activities such as dressing, walking and negotiating stairs.

Exercise is defined as a planned, structured and repetitive activity that aims to improve fitness, and it is a commonly used intervention for people with CP. Aerobic and resistance training may improve activity (i.e. the ability to execute a task) and participation (i.e. involvement in a life situation) through their impact on the primary impairments of CP. However, to date, there has been no comprehensive review of exercise interventions for people with CP.

Objectives

To assess the effects of exercise interventions in people with CP, primarily in terms of activity, participation and quality of life. Secondary outcomes assessed body functions and body structures. Comparators of interest were no treatment, usual care or an alternative type of exercise intervention.

Search methods

In June 2016 we searched CENTRAL, MEDLINE, Embase, nine other databases and four trials registers.

Selection criteria

We included randomised controlled trials (RCTs) and quasi-RCTs of children, adolescents and adults with CP. We included studies of aerobic exercise, resistance training, and 'mixed training' (a combination of at least two of aerobic exercise, resistance training and anaerobic training).

Data collection and analysis

Two review authors independently screened titles, abstracts and potentially relevant full-text reports for eligibility; extracted all relevant data and conducted 'Risk of bias' and GRADE assessments.

Main results

We included 29 trials (926 participants); 27 included children and adolescents up to the age of 19 years, three included adolescents and young adults (10 to 22 years), and one included adults over 20 years. Males constituted 53% of the sample. Five trials were conducted in



the USA; four in Australia; two in Egypt, Korea, Saudi Arabia, Taiwan, the Netherlands, and the UK; three in Greece; and one apiece in India, Italy, Norway, and South Africa.

Twenty-six trials included people with spastic CP only; three trials included children and adolescents with spastic and other types of CP. Twenty-one trials included people who were able to walk with or without assistive devices, four trials also included people who used wheeled mobility devices in most settings, and one trial included people who used wheeled mobility devices only. Three trials did not report the functional ability of participants. Only two trials reported participants' manual ability. Eight studies compared aerobic exercise to usual care, while 15 compared resistance training and 4 compared mixed training to usual care or no treatment. Two trials compared aerobic exercise to resistance training. We judged all trials to be at high risk of bias overall.

We found low-quality evidence that aerobic exercise improves gross motor function in the short term (standardised mean difference (SMD) 0.53, 95% confidence interval (CI) 0.02 to 1.04, N = 65, 3 studies) and intermediate term (mean difference (MD) 12.96%, 95% CI 0.52% to 25.40%, N = 12, 1 study). Aerobic exercise does not improve gait speed in the short term (MD 0.09 m/s, 95% CI -0.11 m/s to 0.28 m/s, N = 82, 4 studies, very low-quality evidence) or intermediate term (MD -0.17 m/s, 95% CI -0.59 m/s to 0.24 m/s, N = 12, 1 study, low-quality evidence). No trial assessed participation or quality of life following aerobic exercise.

We found low-quality evidence that resistance training does not improve gross motor function (SMD 0.12, 95% CI -0.19 to 0.43, N = 164, 7 studies), gait speed (MD 0.03 m/s, 95% CI -0.02 m/s to 0.07 m/s, N = 185, 8 studies), participation (SMD 0.34, 95% CI -0.01 to 0.70, N = 127, 2 studies) or parent-reported quality of life (MD 12.70, 95% CI -5.63 to 31.03, n = 12, 1 study) in the short term. There is also low-quality evidence that resistance training does not improve gait speed (MD -0.03 m/s, 95% CI -0.17 m/s to 0.11 m/s, N = 84, 3 studies), gross motor function (SMD 0.13, 95% CI -0.30 to 0.55, N = 85, 3 studies) or participation (MD 0.37, 95% CI -6.61 to 7.35, N = 36, 1 study) in the intermediate term.

We found low-quality evidence that mixed training does not improve gross motor function (SMD 0.02, 95% CI -0.29 to 0.33, N = 163, 4 studies) or gait speed (MD 0.10 m/s, -0.07 m/s to 0.27 m/s, N = 58, 1 study) but does improve participation (MD 0.40, 95% CI 0.13 to 0.67, N = 65, 1 study) in the short-term.

There is no difference between resistance training and aerobic exercise in terms of the effect on gross motor function in the short term (SMD 0.02, 95% CI -0.50 to 0.55, N = 56, 2 studies, low-quality evidence).

Thirteen trials did not report adverse events, seven reported no adverse events, and nine reported non-serious adverse events.

Authors' conclusions

The quality of evidence for all conclusions is low to very low. As included trials have small sample sizes, heterogeneity may be underestimated, resulting in considerable uncertainty relating to effect estimates. For children with CP, there is evidence that aerobic exercise may result in a small improvement in gross motor function, though it does not improve gait speed. There is evidence that resistance training does not improve gait speed, gross motor function, participation or quality of life among children with CP.

Based on the evidence available, exercise appears to be safe for people with CP; only 55% of trials, however, reported adverse events or stated that they monitored adverse events. There is a need for large, high-quality, well-reported RCTs that assess the effectiveness of exercise in terms of activity and participation, before drawing any firm conclusions on the effectiveness of exercise for people with CP. Research is also required to determine if current exercise guidelines for the general population are effective and feasible for people with CP.

PLAIN LANGUAGE SUMMARY

Exercise interventions for improving activity, participation and quality of life in people with cerebral palsy

Review question

Does exercise improve activity, participation in life situations and quality of life in people with cerebral palsy (CP)?

Background

Cerebral palsy (CP) is caused by an injury to an infant's brain that interrupts normal development. People with CP have reduced muscle strength and aerobic fitness, which may impact their ability to perform activities such as standing, walking, running and to participate in everyday life. Exercise is defined as a planned, structured and repetitive activity that aims to improve fitness. Aerobic exercise aims to improve aerobic fitness, while strength training aims to improve muscle strength. Health professionals often prescribe exercise to people with CP, primarily to improve function, but there has been no comprehensive evaluation of the evidence for the effectiveness of these interventions in people with CP.

Study characteristics



In June 2016 we searched for all studies that investigated the effectiveness of exercise for people with CP. We included 29 trials with a total of 926 participants with CP, 53% of whom were male. Five trials were conducted in the USA; four in Australia; two in Egypt, Korea, Saudi Arabia, Taiwan, the Netherlands, and the UK; three in Greece; and one apiece in India, Italy, Norway, South Africa.

One trial included only adults with CP and three trials included adolescents and young adults. Most trials included children with CP who could walk independently, with or without a walking aid. Four trials also included people who used wheeled mobility devices (e.g. wheelchairs) in most settings and one trial included people who used wheeled mobility devices only. Three trials did not clearly report participants' functional ability and only two trials reported participants' manual ability (use of hands when handling objects). Eight trials compared aerobic exercise to usual care (i.e. the care a patient usually receives in practice), 15 trials compared resistance training (a type of exercise to improve muscular strength) to either usual care or no treatment, 4 trials compared mixed training (aerobic exercise and resistance training) to usual care or no treatment, and 2 trials compared aerobic exercise to resistance training.

Key results

Aerobic exercise may improve activity as indicated by motor function but does not appear to improve gait speed, walking endurance, participation or aerobic fitness among children with CP in the short or intermediate term. There is no research regarding the effect of aerobic exercise on participation or quality of life.

Resistance training does not appear to improve motor function, gait speed or participation in the short or intermediate term, or quality of life in the short term, in children and adolescents with CP but may improve muscle strength.

Mixed training does not improve motor function or gait speed but does improve participation in children and adolescents with CP in the short term.

We found no difference between aerobic and resistance training on motor function but a difference in muscle strength in the short term.

Although the evidence suggests that exercise might be safe for people with CP, only 16 trials (55%) included information on adverse events; these trials reported no serious adverse events. All of the studies we found had small numbers of participants, meaning that we cannot be sure the results are accurate.

Quality of the evidence

We judged the quality of evidence for all comparisons to be low or very low. All of the studies had small sample sizes. There were very few trials involving adults with CP or people with CP who could not walk, so our results may not apply to these groups of people. Few trials provided clear detail about the frequency, intensity and duration of exercise prescribed. Further research assessing the effectiveness of exercise for activity and participation is needed. Such research should determine if the amount and intensity of exercise prescribed to people with CP has an impact on its effectiveness, and whether current guidelines on exercise for the general population apply to people with CP.