Effect of Activity Training in Children with Cerebral Palsy: A Systematic Review with Meta-Analysis

Hsin-Ching Chiu, PT, Ph.D., Theofani A Bania, PT, Ph.D., Assistant Professor, Department of Physical Therapy, I-Shou University, Taiwan, Lecturer, Department of Physiotherapy, TEI of Western Greece, Greece.

Background
Children with cerebral palsy (CP) present with different degrees of limitations in daily activities. Therefore, therapies in children with CP are increasing their focus in training either everyday motor activities, e.g. sit-to-stand or activities such as self-care and leisure activities. There are few previous systematic reviews examining the effect of activity training in children with cerebral palsy. However, most of the reviews failed to separate the activity training from other forms of therapies and were mixed up with low levels of evidence such as case studies. None of previous review examined the independent effect of activity training on activities by combining results in a meta-analysis.

Aim
To find out whether activity training alone or activity training combined with other therapy is effective in children with cerebral palsy.

Methods
Search of Pubmed, Cochrane library, Science direct, OVID, ERIC, Dare and PEDro databases, with language restrictions in English was performed. After references clearly not relevant to the review were deleted full texts of remaining articles were read independently by the 2 reviewers for consideration using predetermined criteria of including only randomized controlled trials, where children with cerebral palsy received activity training as an experimental intervention. Quality of the studies was assessed using the PEDro scale. Measures classified as measures of activity or participation according to the International Classification System (ICF) were used in the analysis.

For data analysis, effect sizes were calculated as standardized mean differences (SMD) (d Hedges unbiased estimator), defined as the difference in post-intervention means divided by the pooled standard deviation. Confidence intervals of effect sizes were also calculated. When possible data were pooled with a random effect model using the Review Manager version 5.2. Statistical homogeneity was tested using the I squared test.

Results
Ten papers were included in the review. Figure 1 presents the studies selection procedure. Most studies had small samples (10 to 30 participants), except for three studies (68 to 128 participants). Also, most studies included children up to 12 years old with spastic hemiplegic or diplegic cerebral palsy.

There were six studies practicing activities only (group A) and four studies practicing activities combined with other therapy such as progressive resistance strength training or stretching exercises (group B). Control groups received no intervention or usual therapy in most studies. Studies had a mean PEDro score of 5.9 (range: 3-8).

Effect of activity training only versus no intervention or other therapies (Group A)
Results from a meta-analysis found no significant difference between groups after intervention (SMD: -0.05; CI: -0.37 to 0.26; I²=4%) (Figure 2). Effect sizes and confidence intervals of individual studies also demonstrated that none of them found significant differences between the experimental and control groups after intervention (confidence intervals crossed zero) for GMFM or balance scale scores (Figure 2). There is, however, a conflicting evidence from 2 studies for timed-up and go.

Effect of activity training combined with other types of therapies versus no intervention or other therapies (Group B)
Data from these studies were not pooled in a meta-analysis as there was high heterogeneity between studies (I²=49%). Effects sizes and their confidence intervals revealed that there was no significant difference between the experimental and control groups for the GMFM (activity) in any of these studies. Significant differences between groups favoring the experimental group over the control group were found for formal activities of Children’s Assessment of Participation and Enjoyment (CAPE) (SMD: 0.53; CI: 0.03 to 1.02) and skill based activities of CAPE (SMD: 0.50; CI: 0.01 to 1.00) following a group aerobic and anaerobic functional exercises program (Figure 3).

Discussion
There is limited evidence that activity training programs result in improvement of activity. A meta-analysis from previous review examined the independent effect of activity training as an experimental intervention. Results in a meta-analysis showed no significant difference between activity training and control groups.

A reason of little effect of activity training may be that although activity training may have improved the activities practiced, this change could not be picked up by the GMFM, which does not look at these particular activities practiced although GMFM was used to measure activity in most studies.

Another reason might be that most activity training programmes were of relatively short duration. This means that longer programmes may be needed to bring about significant increases in the activity of children with cerebral palsy.

Further, it seems to be a lack of rigorous studies comparing activity training versus no intervention or versus a completely different type of intervention. Considering that activities are important for increased physical activity, independence and health in children with cerebral palsy, investigating the effects of activity training versus no intervention should be addressed in future studies.

There are some improvements in participation when activity training was combined with other type of therapy (i.e. resistance training, stretching) was effective in increasing strength training or stretching. As these programs have addressed more than one aspect of participants’ problems, it is possible that they have worked for increasing participation that normally includes the performance of various types of activities, but not for increasing activity that usually includes specific and unambiguous activities.

The results of this systematic review are in line with the results of two previous systematic reviews which also included evidence from case studies. Strengths of this review are the comprehensive search strategy. Limitations are that trials not published in English may have been missed and results cannot be generalized in adolescents and adults with cerebral palsy.

Conclusions
There is limited evidence about the effects of activity training only on activity or participation of children with cerebral palsy. There is little evidence that activity training when combined with other type of therapy (i.e. resistance training, stretching) was effective in increasing participation of children with cerebral palsy.

Implications for future research
Rigorous controlled trials are needed to investigate activity training as the only intervention versus no intervention to explore the effect of activity training in children with cerebral palsy.