

Effect of Conductive Education on Motor Functions for Children with Cerebral Palsy: Systematic Review

FATEN HASSAN ABD EL-AZIM, Ph.D.*; SHIMAA MOAHMED REFAAT, Ph.D.** and RAFIK FAYEZ ATTIA, M.Sc.***

The Department of Physical Therapy for Pediatrics, Faculty of Physical Therapy, Cairo University and Physical Therapy Department, Health Insurance of Egypt*

Abstract

Background: The purpose of this systematic review is to investigate the effect of conductive education on motor functions in children with cerebral palsy.

Aim of Study: The aim of this systematic review was to examine the literature on the effectiveness of conductive education on motor functions in children with cerebral palsy.

Subjects and Methods: Search was made on children with cerebral palsy aged from 1 to 16 years. Search was made in Pubmed, Pedro, Cochrane and google scholar web site up to date. Systematic review of randomized controlled trials, the intervention used was Conductive Education as a group program four studies were selected according to inclusive and exclusive criteria and descriptive analysis was conducted due to heterogeneity. Outcomes effect of Conductive Education on the primary outcomes were motor functions and secondary outcomes were the activities of daily living.

Results: Conductive Education had a significant effect on Motor Functions (gross and fine) and significant effect on the activities of daily living in children with cerebral palsy with maintenance of this effect for a long period of time but, no superiority comes from using it when compared with intensive therapy programs.

Conclusion: The current level of evidence supports the effectiveness of conductive education for improving motor functions in children with cerebral palsy.

Key Words: Systematic review – Cerebral palsy – Conductive education – Motor functions.

Introduction

SYSTEMATIC reviews are generated to focus on answering specific clinical questions [1]. Cerebral palsy describes a group of permanent disorders in movement and posture that limit activity and participation and are attributed to non-progressive

disturbances in the developing fetal or infant brain [2]. Motor functions play a key role in self-care, and independence in self-care is a major goal of conductive education (CE). It was reported that Conductive Education described as a pedagogical approach that addresses all aspects of development (motor, cognitive communication, psychosocial, and activities of daily living) in any learner with a neurological disorder, including such diagnoses as Parkinson's disease or stroke in adults and cerebral palsy or spina bifida in children [3].

Subjects and Methods

Subjects: This systematic reviews concerned children with cerebral palsy (hemiplegia of diplegia), aged between 1 and 16 years.

Methods represented according to criteria included in Cochrane Handbook for Systematic Reviews of Interventions [4]. The clinical questions of this review were: 'What are the effects of conductive education programs in children with CP?' and 'How does it play a role in the neurorehabilitation of children. With CP?' All full-length published articles related to the study concept. Published, full text articles Participants had to be children with Cerebral palsy. This review included studies which demonstrate the clinical effectiveness of conductive education on motor functions in children with cerebral palsy. All published studies with no Language restriction. The intervention is conductive education programs These include the role of the conductor or class leader; facilitations (teaching strategies) known as rhythmic intention, task series and structured program. The importance of the group setting and the impact on motivation and the development of self-efficacy within each child. Conventional rehabilitation modalities in

Correspondence to: Dr. Faten Hassan Abd El-Azim, The Department of Physical Therapy for Pediatrics, Faculty of Physical Therapy, Cairo University

the form of Traditional physical therapies and facilitatory techniques were the comparators to conductive education. Studies that measured outcomes not related to the scope of our study were excluded.

Electronic searches: A literature search used the following electronic and library database. MEDLINE (PubMed).

“<http://www.ncbi.nlm.nih.gov/pubmed/>” (up to date). Cochrane Central Register of Controlled Trials

“<http://www.thecochranelibrary.com/view/0/index.html>” The Cochrane Library (up to date). Pedro “<http://www.pedro.org.au/>” (up to date) Google Scholar “<http://scholar.google.com/eg/>” (up to date).

Search key words used as (Cerebral palsy OR Hemiplegia OR Diplegia) ,(Conductive Education), (Peto technique) and (motor functions).

Outcome measures: All included outcomes in the articles studying the effect of Conductive Education on motor functions in children with cerebral palsy measured immediately after the study and classified as follow:

• *Primary outcomes Motor functions:*

Gross motor functions: Measured by Gross Motor Function Measure (GMFM) and Pediatric Evaluation of Disability Inventory-Functional Skills (PEDI-FS) before and after intervention.

Fine motor functions: Measured by the Fine Motor Scale of the Peabody Developmental Motor Scales before and after intervention.

Secondary outcomes: Activities of Daily Living ADLs. Were measured using the Measurement of Activities of Daily Living (M-ADL) questionnaire.

Data collection and analysis:

A comprehensive systematic literature search conducted to identify all relevant articles. The titles and abstracts were initially screened against the inclusion and exclusion criteria for identification of the relevant trials. When the title and abstract weren't clear, the complete article would be read to determine its suitability.

Data extraction and management:

The authors extracted data from the original papers that were included in this review using a standard extraction form; disagreements were discussed by the two review authors until a consensus was reached.

Data were extracted according to data extraction form developed by the American Academy for cerebral palsy and Developmental Medicine's (AACPD) Treatment Outcomes Committee version [8].

Methodology assessment of the four studies according to the Physiotherapy Evidence Database (PEDro) scale. Table (1).

Table (1): Level of Evidence Database (PEDro) scale.

Criteria	Odman and Birgitta Oberg [6]	Christine Stiller et al., [7]	Rainer Blank et al., [8]	Susan K. Effgen and Laurie Chan, [9]
1- Specified eligibility criteria	Yes	Yes	Yes	Yes
2- Random allocation of participants	No	Yes	No	No
3- Concealed allocation	No	No	No	No
4- Similar prognosis at baseline	Yes	Yes	Yes	Yes
5- Blinded participant	No	No	No	No
6- Blinded therapists	No	No	No	No
7- Blinded assessors	Yes	Yes	Yes	Yes
8- More than 85% follow-up for at least one key outcome	Yes	Yes	Yes	Yes
9- 'Intention to treat' analysis	Yes	Yes	Yes	Yes
10- Between group statistical analysis for at least one key outcome	Yes	Yes	Yes	Yes
11- Point estimates of variability for at least one key outcome	Yes	Yes	Yes	Yes
PEDro score	6/10	7/10	6/10	6/10

Results

Four studies that fulfill inclusive criteria, studying the effect of conductive education on motor functions (as primary outcome) in cerebral palsied children and studying its effect on secondary out-

comes; ADLs. The participants ages range from 1 to 16 years. All studies included in the descriptive analysis due to heterogeneity, Summary of studies characteristics-interventions and participants represented in Table (2).

Table (2): Summary of studies characteristics-interventions and participants.

Group studies	Level of evidence & research design	Conduct rating	Participants	Ages	Total n.	Intervention protocol	Control intervention
Odman and Birgitta Oberg [6]	Level IV	Moderate 5/7	Cerebral palsied children (hemiplegia or diplegia) aged from 3 to 16 years, had a Gross Motor Function Classification System (GMFCS score) of I or II	3 to 16 years	52	For study groups: 1st group received Intensive training at Move & Walk with conductive education	2nd group received traditional healthcare physical therapy
Christine Stiller, et al., [7]	Level II	Strong 6/7	Cerebral palsied children	2 years 5 months to 9 years 3 months	19	1st group (study) received conductive education program.	2nd group (control) received intensive therapy and special education programs.
Rainer Blank, et al., [7]	Level III	Strong 6/7	Sixty-four children with CP, severity Gross Motor Function Classification System levels II through IV	3 to 6 years	67	Intensive conductive education with 3- to 4-week blocks embedded in a 9-month period of conventional Treatment	2nd group (control) received intensive therapy and special education programs
Single subject studies	Level of evidence & research design	Conduct rating	Participants	Ages	Total n.	Intervention (Includes description of baseline and intervention phases, length of intervention, duration etc.)	
Susan K Effgen and Laurie Chan, [9]	Level III	Moderate 10/14	Cerebral palsy children had a Gross Motor Function Classification System (GMFCS score) of III	42 to 72 months	9	CE program with the occurrence of gross motor behaviors throughout the school day.	

Description of the included studies:

A detailed description of each study includes description of participant, intervention for study and control groups, outcomes measures used and summarized result:

Odman and Birgitta Oberg [6], carried out 52 children aged from 3 to 16 years. Most of them were classified as GMFCS level 4 and 5. There were a high number of children classified as GMFCS 5 in Move & Walk group. Accordingly, initial difference in pre-test value so mean GMFM total score, GMFM dimensions, PEDIFS mobility

and social function domain showed a higher level of function among children in Lemothanin Move & Walk. A 4-week intensive training period facilitated small improvement in gross motor functions. Intensive training at Move & Walk with conductive education or at Lemo with in the traditional health care system showed similar effects. The majority of children had a high consumption of training during the study period and the added value of repeated intensive training periods was limited to appositive effect in social function at the 1-year follow-up. Further research is needed. Authors concluded that there is no major differences were

shown between the 2 training programmes. One intensive training period facilitated small improvement in gross motor function. The majority of children had a high consumption of training during the 1-year follow-up and the added value of repeated intensive training periods was limited. Further research is needed in this area to help determine the most effective frequency, duration, and type of intervention to improve gross motor skills in children with CP. Gross motor functions were measured by the Pediatric Evaluation of Disability Inventory (PEDI), and the Gross Motor Function Measure (GMFM).

Susan Effgen and Laurie Chan [9], carried out. Nine children with a diagnosis of CP participated in the study. Their ages ranged from 42 to 72 months at the start of the study. They were all learning to walk. Their average and median Gross Motor Classification System Score was level III (walks with assistive devices; limitation walking outdoors and in the community). Conductors from Hungary would visit periodically to monitor the program. The children participated in a full-day CE program, 5 days a week for 11 months each year. This study provides preliminary evidence that CE pre-school programs might provide sufficient opportunities to practice gross motor skills such as independent sitting and assisted walking necessary to achieve related individualized gross motor objectives. Further research is needed in this area to help determine the most effective frequency, duration, and type of intervention to improve gross motor skills in children with CP. Authors concluded that this study provides preliminary evidence that CE preschool programs might provide sufficient opportunities to practice gross motor skills such as independent sitting and assisted walking necessary to achieve related individualized gross motor objectives. Further research is needed in this area to help determine the most effective frequency, duration, and type of intervention to improve gross motor skills in children with CP.

Fine motor functions were measured by the Fine Motor Scale of the Peabody Developmental Motor Scales.

Rainer Blank, et al. [8] carried out. Sixty-four children with CP, severity Gross Motor Function Classification System levels II through IV, ages 3 to 6 years. Interventions: Phases B: A 4.5-month period of special education, including 2 hours of individual physiotherapy or occupational therapy per week (special education). Phase A: during a 9-month period, conductive education was administered in 3 blocks of 4 weeks (7 hours daily from

Monday through Friday); between the blocks, special education was applied as in the B phases. CE improved coordinative hand functions and ADLs in children with CP. There was no effect on elementary hand functions. Further research is needed in this area. Authors concluded that CE improved coordinative hand functions and ADLs in children with CP. There was no effect on elementary hand functions. ADLs were measured in one study, in a study by Rainer Blank, et al. [8] were measured using the Measurement of Activities of Daily Living (M-ADL) questionnaire. Authors concluded that Conductive education improved coordinative hand functions and ADLs in children with CP. There was no effect on elementary hand functions.

Christine Stiller, et al., [7] carried out. 19 children with cerebral palsy participated in a five-week program of conductive education, intensive therapy, or special education. Using the Pediatric Evaluation of Disability Inventory (PEDI), the Gross Motor Function Measure (GMFM), and the Fine Motor Scale of the Peabody Developmental Motor Scales before and after intervention. Professionals providing treatment and parents completed a survey about their perceptions of change in the children. Greatest improvements were noted in the group receiving intensive therapy, with children in all groups showing some improvement in function. Further research is needed in this area. Authors concluded that there is. Greatest improvements were noted in the group receiving intensive therapy, with children in all groups showing some improvement in function. Further research is needed in this area to help determine the most effective frequency, duration, and type of intervention to improve gross motor skills in children with CP.

Discussion

The purpose of the current systematic review is to evaluate the effectiveness of conductive education on primary outcomes; motor functions in form of (gross motor functions and fine motor functions) and secondary outcomes; ADLs in children with cerebral palsy, this review includes studies published from 2003 up to 2008 and searched on Medline data base through Pub Med and Pedro that most likely include a huge amount of papers published each year, Cochrane library also was searched and Google scholar web site. Only published trials were included in the current systematic review, unavailable relevant articles which may show positive or negative results were not included in the review. This systematic review aims to evaluate mainly the effect of Conductive

Education on motor functions in children with cerebral palsy.

This systematic review analyzed 4 articles, by applying strict selection criteria for inclusion; only full text articles were included and participants had to be children with Cerebral palsy aged from 1 to 16 years. After collecting data according to items of AACPD sheet it was found that: From all 4 studies included one study fulfill the criteria of high methodological quality which judged as strong ("yes" on 6-7 questions), three studies fulfill the criteria of moderate methodological quality ("yes" on 10-14, 4-7 and 5-7 questions) according to AACPD method of quality assessment of the studies reflecting the quality of included studies. Outcomes studied in this review were classified as primary and secondary outcomes.

Primary outcome included mainly the effectiveness of conductive education on motor functions in children with cerebral palsy which was studied in all of the included studies by Rainer Blank, et al. [8], Christine Stiller et al. [7], Odman & Birgitta Oberg [6] and Susan Effgen & Laurie Chan, [9]. All 4 studies included in the descriptive analysis.

The study by Odman and Birgitta Oberg [6] which included in descriptive analysis, the study evaluated motor functions which assessed using Gross Motor Function Measure (GMFM) and Pediatric Evaluation of Disability Inventory-Functional Skills (PEDI-FS). After application of Conductive Education, and found that participants who received Conductive Education had refinement of motor functions another study included in descriptive analysis by Susan Effgen and Laurie Chan, [9]. Who conducted a study exploring effect of using Conductive Education on gross motor functions in children with cerebral palsy. The study evaluated gross motor functions which assessed by Gross Motor Function Measure (GMFM). They concluded that Conductive Education was found to be effective in motor functions development another study included in descriptive analysis by Rainer Blank, et al. [8], who study the effects of conductive education, on children with cerebral palsy (CP), on their hand motor functions which assessed by grip force analysis system. They concluded that Conductive education improved coordinative hand functions in children with CP. There was no effect on elementary hand function. another study included in descriptive analysis by Christine Stiller et al., [7] study The Effect of Conductive Education, Intensive Therapy, and Special Education Services on Motor Skills in Children with Cerebral Palsy the Pediatric Evaluation of Disability Inventory (PEDI),

the Gross Motor Function Measure (GMFM), and the Fine Motor Scale of the Peabody Developmental Motor Scales before and after intervention. They concluded that Greatest improvements were noted in the group receiving conductive education with children in all groups showing some improvement in function.

This previous results supported by Palisano, Snider and Orlin [10] who described current best practice within traditional therapy to include interventions that improve adaptive functions, muscle strength and length, fitness, and prevention of secondary impairments. Major CE texts support these interventions also by allowing time to practice and repeat tasks within an active program; by attempting to improve motor control utilizing the facilitations described in this paper; by promoting stretching and strengthening muscles; by promoting the wearing of splints and orthoses; and by using task analysis and adaption of tools or parts of a task to promote function [11]. Both do deliver integrated multidisciplinary treatment within groups, although such groups in traditional settings tend to occur mainly in early intervention. As is consistent with a philosophy that promotes the child's learning, a conductor teacher may first direct the child verbally, and alter the environment so that a child achieves success in a task, rather than direct, manual handling. Conductor-teachers promote the child's goals in self care, mobility, and social skills simultaneously, within the group program [12]. Traditional therapists have specialized skills that result in expertise in specific aspects of the child's development, such as the occupational therapist being more concerned with upper limb function and the physical therapist attending to mobility issues. Traditional therapists are trained in the use of outcome measures and evidence-based practice, and work more closely with scientific and medical models. CE-based programs tend to refer to education-based models, unless staffed by traditional therapists who are evidence-based practitioners.

Secondary outcomes (which may be prerequisites for primary outcomes and have an effect on them) in this review included ADLs were measured in study by Rainer Blank, et al [8] using the Measurement of Activities of Daily Living (M-ADL) questionnaire. Authors concluded that Conductive education improved coordinative hand functions and ADLs in children with CP. There was no effect on elementary hand functions.

From the previous studies it can be concluded that conductive education should be considered as

a treatment supplement in the physical therapy program for children with cerebral palsy who have developmental problems in motor functions although we need future research.

Evidence based practice is needed to improve quality of health care. A body of evidence regarding safety, effectiveness, appropriate indications, cost-effectiveness, and other attributes of medical care are demanded [13].

As the treatment strategies are rapidly increasing and changeable so in order to cope with the new information about the traditional treatment strategies and the recent strategies so physical therapists have to use the evidence in practice to improve the quality of patient care and to ensure that the best update of treatment is delivered. However, incorporating research into practice is time consuming, and so we need methods of facilitating easy access to evidence for busy clinicians, systematic reviews aim to inform and facilitate this process through research synthesis of multiple studies, enabling increased and efficient access to evidence.

Conclusion:

The current level of evidence of the effectiveness of conductive education on motor functions in children with cerebral palsy remains weak. The main limitations are the heterogeneity between included studies in the review and the small number of the studies involved.

References

- 1- GARG A.X., HACKAM D. and TONELLI M.: Systematic Review and Meta-Analysis: When One Study Is Just Not Enough. *Clin. J. Am. Soc. Nephrol.*, 3: pp. 253-260, 2008.
- 2- ROSENBAUM P., PANETH N. and LEVITON A., et al.: A report: The definition and classification of cerebral palsy April 2006. *Dev. Med. Child Neurol. Suppl.*, 109: 8-14. [Medline], 2007.
- 3- SUTTON A.: Conductive Education. *Arch. Diseases Childhood*, 63: 214-217, 1988.
- 4- HIGGINS J.P.T. and GREEN S.: *Cochrane Handbook for Systematic Reviews of Interventions*. In: The Cochrane Library, Issue 4. Chichester, UK: John Wiley & Sons, Ltd, 2011.
- 5- American Academy for cerebral palsy and Developmental Medicine's AACPDM: Treatment Outcomes Committee Methodology to develop systematic reviews of treatment interventions-version: www.aacpdm.org/resource/systematicreviewmethodology.pdf, 2004.
- 6- ODMAN P.E. and OBERG B.E. : Effectiveness and expectations of intensive training: A comparison between child and youth rehabilitation and conductive education. *Disabil Rehabil*, 2005.
- 7- STILLER C., MARCOUX B.C. and OLSON R.E. : The effect of conductive education, intensive therapy and special education services on motor skills in children with cerebral palsy. *Physical & Occupational Therapy in Pediatrics*, 2003.
- 8- RAINER BLANK and RÜDIGER VON KRIES: *Conductive Education for Children With Cerebral Palsy Effects on Hand Motor Functions Relevant to Activities of Daily Living*. *Physical & Occupational Therapy in Pediatrics*, 2008.
- 9- SUSAN K. EFFGEN and LAURIE CHAN: Occurrence of gross motor behaviors and attainment of motor objectives in children with cerebral palsy participating in conductive education. *Physiotherapy Theory and Practice*, 2008.
- 10- PALISANO R.J., SNIDER L.M. and ORLIN M.N.: Recent advances in physical and occupational therapy for children with cerebral palsy, 2004.
- 11- WITHALL L. and COTTER C.: *Applying the Principles of Conductive Education in Schools, A Guide to Curriculum Development and Delivery*. Australia: Coa Press, 1997.
- 12- HARI M. and AKOS K.: *Conductive Education*. Translated by Smith, N.H. and Stevens, J. (1988), London: Routledge, 1971.
- 13- MANCHIKANTI L.: *Evidence-Based Medicine Systematic Reviews, and Guidelines in Interventional Pain Management*, 2008.

تأثير قدرة التعلم التوصيلي على الوظائف الحركية عند الأطفال المصابين بالشلل الدماغي

الهدف : تهدف هذه الدراسة إلى تقييم قدرة التعلم التوصيلي على الوظائف الحركية عند الأطفال المصابين بالشلل الدماغي.

طرق البحث: فحص منهجي للتجارب العشوائية المضبوطة التي تتضمن تأثير قدرة التعلم التوصيلي على الوظائف الحركية عند الأطفال المصابين بالشلل الدماغي وقد تم تصنيف المخرجات كمخرجات أولية وهي الوظائف الحركية الكبرى والدقيقة ومخرجات ثانوية. تم البحث في Pubmed ومكتبة Cochrane و PEDro الباحث العلمي في Google حتى تاريخه،

نتائج الدراسات: تم اختيار اربع دراسات تم تحليلها وصفيًا لقياس المخرج الأولى على الفور بعد التدريب، وباقي المخرجات الثانوية تم تناولها بالشرح وقد أظهرت الدراسات تحسن واضح في الأداء باستخدام التعلم التوصيلي مع الحفاظ على هذا التأثير لفترة طويلة من الزمن ولكن التحليل الإحصائي أظهر عدم وجود فرق ملحوظ بينه وبين العلاج الحركي الناتج عن التقييد على كل من الأداء باستخدام التعليم التوصيلي.

الإستنتاج: المستوى الحالي للدليل الذي تم التوصل إليه يدعم تأثير التدريب باستخدام التعليم التوصيلي لتحسين الوظائف الحركية في الأطفال المصابين بالشلل الدماغي المفلوج مع عدم وجود فرق ملحوظ بينه وبين العلاج الحركي الناتج عن التقييد، بينما الدليل لا يزال ضعيفاً.