

There was insufficient evidence to determine whether occupational therapy interventions to improve the use of the upper limb also enhanced social participation in children with cerebral palsy.

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CLINICAL SCENARIO:

Cerebral palsy is a common childhood disorder arising early in life from a non-progressive congenital or acquired abnormality of the brain. Children with cerebral palsy often have difficulties that affect the use of their hands and therefore have limited opportunities to participate and experience the things that occur in everyday life. For example, a child with upper limb spasticity may have difficulties holding a pencil, manipulating cutlery, or putting on a jumper.

The focus of occupational therapy has traditionally been on reducing the child's impairment to improve motor and functional abilities and research to-date has primarily explored these issues. Occupational therapists are also interested in the promotion of participation, well-being and quality of life. The physical disability and paucity of movement experienced by children with cerebral palsy is assumed to impact their social participation. For example, a child with upper limb spasticity may have difficulty keeping up with peers on play equipment in the school yard and consequently be excluded from play activities and games with friends. It is important for social participation to be sufficiently understood and measured as an outcome.

The purpose of this CAT is to review current research evidence to investigate the assumption that occupational therapy interventions that improve upper limb use also enhance social participation in children with cerebral palsy.

FOCUSSED CLINICAL QUESTION: Do occupational therapy interventions that improve upper limb use also enhance social participation in children with cerebral palsy?

SUMMARY of Search, 'Best' Evidence' appraised, and Key Findings:

Seven databases were searched comprehensively. Developmental Medicine and Child Neurology and the Scandinavian Journal of Rehabilitation Medicine, were hand-searched. Reference lists of all retrieved articles were also searched.

Four articles fulfilled the inclusion criteria and were of sufficient quality. One systematic review found no evidence to support occupational therapy interventions to improve functional ability and social participation in children with cerebral palsy (Steultjens et al., 2004). Another systematic review (Boyd, Morris, & Graham, 2001) and a randomized controlled trial (Fehlings, Rang, Glazier, & Steele, 2000) found emerging evidence that botulinum toxin A injections plus occupational therapy improved upper limb function, however, social participation was not directly measured. A single subject design study provided evidence that Family Centred Functional Therapy increased participation in desired tasks (McGibbon, Lammi & Law, 2003).

CLINICAL BOTTOM LINE:

There was insufficient evidence to answer the clinical question. Further research is required to determine whether occupational therapy interventions that improve upper limb use, also enhance social participation for children with cerebral palsy.

Limitation of this CAT: This CAT has been peer-reviewed by one other independent lecturer.

SEARCH STRATEGY:

The overall search strategy was developed to identify any occupational therapy upper limb intervention study that included social participation as a potential outcome. Any level of evidence was initially be accepted.

Terms used to guide Search Strategy:

Population	Intervention	Outcome
Cerebral palsy Hemiplegia Muscle spasticity Spastic diplegia Spastic hemiplegia Spastic quadriplegia	Activities of daily living Botulinum toxin Botulinum toxin A Casting Daily life activities Constraint induced movement therapy Exercise/strength training Family centred functional therapy Family centred therapy Functional training Hand therapy Leisure Motor interventions Motor interventions Motor performance Motor skills Motor skills training Muscle strengthening Neurodevelopmental therapy Neuromuscular facilitation Occupational therapy Physical modalities/orthotics/splinting Positioning Recreation Skill acquisition/training Task specific training	Community Home Leisure Participate Participation Play Recreation School Social aspect Social interaction Socialization Social participation

Databases and sites searched	Search Terms	Limits used
CINAHL (1982 – March 2005), EMBASE (1996 – March 2005), Medline (1996 – March 2005), Cochrane Library (April 7, 2005), PsychInfo (1985 – March 2005), OTSeeker (March 25, 2005) and PedRO (March 25, 2005).	Dependent on database specific terms and search methods	Nil

Two journals identified as premier resources for cerebral palsy, The Journal of Developmental Medicine and Child Neurology (1988 – March 2005) and the Scandinavian Journal of Rehabilitation Medicine (2001 – March 2005), were searched individually for relevant articles.

INCLUSION and EXCLUSION CRITERIA

Inclusions:

- Studies were intervention research studies
- Participants were children (0-18 years)
- Participants had a diagnosis of cerebral palsy
- The year of publication did not precede 1990
- Occupational therapy was included as an intervention
- Interventions involved upper limb function
- Social participation was addressed in the study

Exclusions:

- Studies not reported in English

RESULTS OF SEARCH

Twenty-three articles were initially identified based on title and abstract and categorised as shown in Table 1 (based on Levels of Evidence, Centre for Evidence Based Medicine, 1998).

Table 1: Summary of Study Designs of Articles retrieved

Study Design/ Methodology of Articles Retrieved	Level	Number Located	First Author (Year)
Systematic Review	I	4	Wasiak, (2004)
			Steultjens, 2004
			Brown(2001), Boyd, 2001
Randomized Clinical Trial	II	4	Taub, (2004)
			Ketelaar (2001)
			Law, (1997)
			Law, (1991)
Clinical trials, Cohort studies	III	4	Fehlings,(2000)
			Stiller, (2003)
			Yang, (2003)
			Kerem, (2001)
Single Subject, Single case, Case reports/studies	IV	6	Case-Smith, (1996)
			McGibbon Lammi, (2003)
			Charles, (2001)
			Crocker, (1997)
			Guidetti, (2001)
			Pierce, (2002)
Expert opinion, review	V	5	DeLuca, (2003)
			Wilton, (2003)
			Copley, (1996)
			Hoare, (2004)
			Palisano, (2004)
			King, (2004)

BEST EVIDENCE

- Of the 23 articles initially identified, 5 articles, classified as Level V based on title and abstract, were excluded from the review.
- Full texts of the remaining 18 articles were obtained and read by three reviewers to determine if the study met the 7 inclusion criteria. Discrepancies in judgment were discussed until consensus was reached.
- Five articles were selected; two systematic reviews (Steultjens et al., 2004, Boyd et al., 2001), two randomised controlled trials (RCTs) (Taub et al., 2004, Fehlings et al., 2000) and a single subject design study (McGibbon Lammi & Law, 2003).
- These five articles were critiqued using either the McMaster Guidelines (Law, Stewart et al., 1998) or the GATE guidelines (Jackson, 2004).
- One RCT (Taub et al., 2004) was then excluded from the CAT as it was found to be of very poor methodological quality.

SUMMARY OF BEST EVIDENCE

Table 2: Characteristics of the studies appraised

First Author Study	Boyd, et al. (2001) Systematic Review of RCTs	Steultjens, et al. (2003) Systematic Review of RCTs & other study designs	Fehlings, et al. (2004) Randomized Controlled Trial (RCT)	McGibbon Lammi, & Law (2003) Single Subject Design
Design				
Sample Size	4 studies, all RCTs	17 studies – 8 x RCT, 9 x Other	N = 29: 14 Treatment, 15 Control	N = 3: 1 + 2 repetitions
Inclusion Criteria	<ul style="list-style-type: none"> – High level (Sackett's criteria) – Prospective studies – Objective outcome measures – Moderate – high methodological quality score (PEDro) – Calculable effects size. 	<ul style="list-style-type: none"> – Efficacy studies – OT intervention – CP < 19 years – Measured functional ability or SP – Full length publication 	<ul style="list-style-type: none"> – Children aged 2 ½ - 10 years – Hemiplegic CP – Moderate spasticity in thumb, wrist or elbow – Able to move fingers voluntarily 	<ul style="list-style-type: none"> – Children aged 36 - 71 months – CP – GMFCS ≥ level III
Intervention Investigated	<ul style="list-style-type: none"> – NDT & intensive OT + OT – BTA injections + OT 	<ul style="list-style-type: none"> – Sensorimotor training – Training of specific skills – Parental counselling & education – Aids/equipment advice – Splinting – Comprehensive OT – N/A 	<ul style="list-style-type: none"> – Upper limb BTA injections + OT – OT alone 	<ul style="list-style-type: none"> – Family Centred Functional Therapy focusing on upper limb tasks – No intervention
Comparison Intervention	<ul style="list-style-type: none"> – N/A 	<ul style="list-style-type: none"> – N/A 	<ul style="list-style-type: none"> – OT alone 	<ul style="list-style-type: none"> – No intervention
Outcomes Used	<ul style="list-style-type: none"> – Sackett's levels and PEDro classification of quality – Effect sizes calculated, forest plot constructed 	<ul style="list-style-type: none"> – Best evidence synthesis 	<ul style="list-style-type: none"> – QUEST – PEDI – Passive range of motion – Grip strength & spasticity -MAS 	<ul style="list-style-type: none"> – COPM – PEDI – PQRS
Social Participation Addressed	<ul style="list-style-type: none"> – Not directly. Looked at children's participation in ADLs which form part of SP 	<ul style="list-style-type: none"> – Yes. Only paper located that set out to investigate SP. 	<ul style="list-style-type: none"> – Not directly. PEDI measured children's independence from caregivers & participation in self-care tasks which are elements of SP 	<ul style="list-style-type: none"> – Not directly. COPM & PEDI measured participation in & performance of self-care - potentially an element of SP. COPM measured satisfaction.
Findings	<ul style="list-style-type: none"> – Best evidence found for serial casting + OT – Increasing evidence for BTA + OT or PT in reducing spasticity and improving functional ability 	<ul style="list-style-type: none"> – No evidence to support any of the interventions improving functional ability and SP 	<ul style="list-style-type: none"> – Statistically significant improvements in UL weight bearing (QUEST) for BtA group – Statistically significantly increased participation in self-care tasks (PEDI) 	<ul style="list-style-type: none"> – 1-2 goals achieved each child – Positive changes in both performance of, & satisfaction with, functional activities

Note: CP = cerebral palsy; OT = occupational therapy; NDT = Neuro-developmental therapy; BTA = Botulinum Toxin Type A; QUEST = Quality of Upper Extremity Skills Test; PEDI = Pediatric Evaluation of Disability Inventory; MAS = modified Ashworth Scale; COPM = Canadian Occupational Performance Measure; PQRS = Performance Quality Rating Scale; ADLs = Activities of Daily Living; PT = Physiotherapy; SP = Social Participation; GMFCS = Gross Motor Function Classification System.

SUMMARY OF BEST EVIDENCE

Table 3a: Description and appraisal of systematic review by Boyd, Morris & Graham, 2001.

Aim/Objective of the Systematic Review:

To evaluate the effectiveness of the management of upper limb dysfunction in children with cerebral palsy.

Study Design: Systematic review

Search strategy: 10 different databases searched with clear and comprehensive search terms. Abstracts of five major meetings were hand searched to locate relevant authors or literature. Only English language, full text articles were included in the review.

Study selection criteria:

Trial designs	- Randomised - Non-randomised trials
Study participants	- "Children with cerebral palsy treated for spasticity in the upper limb" (p. 152)
Study interventions	- Physiotherapy - Occupational Therapy - Neurodevelopmental Therapy (NDT) - Contemporary Movement Therapy - Constraint Induced Movement Therapy (CIMT) - Serial Casting - Neuromuscular Electrical Stimulation - Botulinum Toxin A Injections (BtA) - Orthopaedic Surgery
Outcomes included	- Impairment (E.G Spasticity, Range, Strength) - Activity (E.G. PEDI, QUEST) - Participation (E.G. COPM) - Contextual Factors (E.G. Health Related Quality Of Life, goal attainment, economic analysis)
Final inclusion criteria	- High level research (using Sackett et al. levels) - Prospective study - Objective outcome measurement - Moderate-high methodological quality as per Pedro scale - Effect size could be calculated from data

Methods:

Validity of included studies – assessed for RCTs only using PEDro scale

Analysis	- Meta analysis not possible due to heterogeneity of studies and outcomes - Results presented as calculated effect sizes - Forest plot of standardised mean difference (+95%confidence interval) for five outcomes of three studies)
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Main Findings:

Results of search	- 70 publications relating to 60 trials met initial inclusion - 14 excluded - 56 trials reported on descriptively, of these - 5 randomised controlled trials met all inclusion criteria for full analysis
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Validity of RCTs	- 4 of 5 RCT's rated 9 -11 on PEDro scale (Law et al., 1991, Law et al., 1997, Corry et al., 1997, Fehlings et al., 2000)
	- Corry only provided median values, no further analysis
Treatment effect (TE)	- Law et al. 1991: Intensive NDT + casting (TE = 4.89)
	- Law et al. 1991: Intensive NDT only (TE = 0.8)
	- Law et al. 1991: Regular OT + casting (TE = 7.02)
	- Law et al. 1991: Regular OT only (TE = 1.34)
	- Law et al. 1997: Intensive NDT + casting (TE = 2.0)
	- Law et al. 1997: Regular OT only (TE = 5.8)
	- Fehlings et al. 2000: OT only @ 1 month (TE = 1.68)
	- Fehlings et al. 2000: OT only @ 6 months (TE = 6.56)
	- Fehlings et al. 2000: BtA + OT @ 1 month (TE = 13.3)
	- Fehlings et al. 2000: BtA + OT @ 6 months (TE = 11.71)

All data reported from page 157. All 95% confidence intervals include zero except Fehlings et al. 2000: BtA + OT at both 1 and 6 months. All confidence intervals were wide.

Original Authors' Conclusions

Lack of RCT evidence to support effectiveness of upper limb interventions for children with cerebral palsy.

Emerging evidence to support effectiveness of BtA and OT to improve upper limb function.

Further research urgently required.

Critical Appraisal:

Validity

This was a well conducted systematic review. The database and abstract search was comprehensive and should have been adequate to identify most appropriate research. The review had a clear purpose and systematic criteria for study inclusion. The use of the PEDro rating scale validated the authors' decision-making around inclusion of good quality randomised controlled trials.

A significant portion of the paper was devoted to discussion of non-randomised trials and the clinical implications of the results of these studies. This has not been reported in this CAT

Interpretation of Results

Evidence was found to support occupational therapy plus serial casting, and also BtA injections with occupational therapy, in improving upper limb function for children with cerebral palsy. Although large effect sizes were reported from three different trials, all 95% confidence intervals were wide; no estimates were precise. Only BtA plus OT (Fehlings et al.) was found to provide a statistically significant treatment effect in favour of the treatment group. This study will be examined more closely later in this CAT.

Summary/Conclusion:

The systematic review by Boyd, et al. did not directly address social participation, but rather several components of participation including children's involvement in activities of daily living. These results may be clinically important when looking at social participation because daily occupations require the skills of our hands and are often used in play, school activities and self-care tasks. Improved upper limb function may, therefore, lead to greater independence and increased ability to perform many occupations; however this has not yet been demonstrated.

Table 3b: Description and appraisal of systematic review by Steultjens, Dekker, Bouter, van de Nes, Lambregts & van den Ende, 2004.

Aim/Objective of the Systematic Review:

“Do occupational therapy interventions improve functional ability and social participation for children with cerebral palsy?” (p.2)

Study Design: Systematic review

Search strategy:

- Comprehensive search of MEDLINE (1966-June 2003), CINAHL (1982-Dec 2002), EMBASE (1982-Dec 2002), SCISEARCH (1974-Dec 2002, AMED (1985-Dec 2002), Cochrane Controlled Trials Register and The Rehabilitation and Related Therapies Field.
- Two Dutch libraries were also searched: Dutch National Institute Allied Health Professions (NPI) and Netherlands Institute for Health Services Research (NIVEL).
- Identified article's reference lists were hand searched, and relevant authors were contacted directly to identify any further studies. To be included, all studies were full length publications

Included studies:

- | | |
|---------------------|--|
| Trial designs | - Randomised controlled trials
- Controlled clinical trials
- Other study designs (single subject designs excluded) |
| Study Participants | - Children less than nineteen years of age with cerebral palsy |
| Study interventions | - Six intervention categories were developed by four occupational therapists and one reviewer: <ol style="list-style-type: none"> 1) Sensorimotor functions 2) Activities of daily living 3) Parent education and counselling 4) Assistive devices and mobility aids 5) Splints 6) Comprehensive OT (included all of the above). |

Outcomes included: - Included studies must use “functional ability” or “social participation” or terms which are indicators of successful treatment such as muscle tone or upper extremity function

Methods

Methodology Quality: - Assessed independently by two reviewers, using criteria suggested by van Tulder et al. (1997). The criteria related to internal validity, descriptive elements and statistical criteria.
- Controlled designs were assessed using the full version of the criteria suggested by van Tulder et al. (1997), whereas the uncontrolled designs were assessed with a version modified by the authors.

Analyses - Meta-analysis was not performed due to the heterogeneity of participants, interventions and outcome measures of the studies
- a best-evidence synthesis was performed
- Analysis accounted for the study design, methodological quality, outcome measures and statistical significance of the results
- Analysis was performed for each of the six intervention categories

Main Findings:

- An initial 1004 studies were retrieved.
- Reduced to 128 articles based on title and abstract
- Of these, 47 studies involved children with cerebral palsy and the efficacy of occupational therapy
- 30 studies did not meet the eligibility criteria and were excluded
- 17 fulfilled the eligibility criteria:
 - 7 were randomised control trials (one of high quality)
 - 1 was a controlled clinical trial (low quality)
 - 9 were designs other than controlled designs (two of sufficient quality)
- One RCT (Exner, 1983) had high methodological quality and 2 other designs (Blair, Ballantyne, Horsman, Chauvel, 1995; Nicholson, Morton, Attfield & Rennei, 2001) had sufficient methodological quality. All were studies of splinting efficacy.
- Only one of these studies (Nicholson et al, 2001) presented significant results (in favour of lycra garments)
- The other sixteen studies reported no significant results.

Original Authors' Conclusions

- Insufficient evidence was produced from the analysis of the studies within each occupational therapy intervention category to demonstrate the efficacy of interventions to improve functional ability and upper extremity function.
- Social participation was not the focus of, nor measured in any study.
- Future research must be methodologically rigorous.

Critical Appraisal:

Validity

Limitations of the search strategy

- Modifications of search terms made to the different databases were performed by an "experienced medical librarian" (p. 2). It is not clear what role the authors had in conducting or refining the search.
- No alternatives were included for the term cerebral palsy thus the search may have missed relevant articles.
- The Journal of Developmental Medicine and Child Neurology, known as a premier journal for cerebral palsy research, was not included as a resource.

Limitations of the methodological appraisal

- While an example of the tool used to evaluate the methodological quality was provided in the appendix, the validity of the tool is unclear. Components of the tool were attributed to at least three sources.
- No information was provided as to the appraisal tool's reliability.

Interpretation of Results

- Only one splinting study was found to show significant results. Only a "significant p value" was reported, no data.
- Some studies included in the Boyd et al., systematic review as being of high quality (rated by PEDro scale) and with small positive treatment effects, were excluded by this review as they were deemed low quality.

Summary/Conclusion:

- No conclusive findings were found to support the efficacy of occupational therapy interventions for children with cerebral palsy.
- The conclusions reached by the authors may need to be interpreted with caution due to the possible limitation in using the tool proposed by van Tulder (1997) to assess the methodological quality of the included studies and the criteria for determining positive evidence.

Table 3c: Description and appraisal of randomised controlled trial by Fehlings, Rang, Glazier & Steele, 2000

<p>Aim/Objective of the Study: To investigate whether intramuscular botulinum toxin A (BtA) injections combined with occupational therapy in comparison to occupational therapy alone improved upper extremity function in children with spastic hemiplegic cerebral palsy.</p> <p>Study Design: Randomised controlled, single-blind trial. Randomisation by computer generated numbers table. Allocation concealment not specified.</p> <p>Setting: Metropolitan Canada</p>	
<p>Participants</p> <p>Sample n = 30 (20 boys, 10 girls), 2.5 - 10 years, hemiplegic cerebral palsy</p> <p>Inclusion criteria Moderate spasticity at elbow, wrist or thumb with Modified Ashworth Scale score ≥ 2. Full PROM & Can initiate voluntary digit movement</p> <p>Exclusion criteria Children who used a rigid splint.</p> <p>No statistically significant differences between groups on any outcome or key variable at baseline. One child dropped out of the treatment group before the one month assessment</p> <p>Intervention Investigated Comparison between groups receiving occupational therapy alone or BtA plus occupational therapy.</p> <p>Injections (Treatment Group) Botox®: 2-6U/kg Muscle groups: Biceps Brachialis, Pronator Teres, Flexor Carpi Ulnaris, Adductor Pollicis Longus, Flexor Digitorum Profundus, Flexor Digitorum Superficialis</p> <p>Occupational therapy Minimum frequency once per 2 weeks in community. Guidelines provided to therapists</p> <p>Assessment Frequency 0, 4, 12 & 24 weeks.</p> <p>Outcome Measures Modified Ashworth Scale (scores 0, 1, 1+, 2, 3, 4) Passive Range of motion Quality of Upper Extremity Skills Test (QUEST) scores calculated as a percentage Pediatric Evaluation of Disability Inventory (PEDI), scaled scores range from 0 – 100.</p> <p>Outcomes measured by assessor blind to intervention group.</p> <p>Data analysis: Alpha Level - 0.05 primary outcomes, 0.01 secondary outcomes 2 way analysis of variance for between group differences Post hoc analysis using Wilcoxin rank sums test.</p>	

Main Findings:

- A statistically significant improvement, favouring the treatment group, was demonstrated on the primary outcome measure, the QUEST ($F_{(1,83)} = 4.69, p=0.039$).
- Differences were significant at one month ($p=0.01$), however, not at 3 ($p=0.13$) or 6 months ($p=0.14$).
- Of the four QUEST domains, only weight-bearing showed a significant improvement for the treatment group ($p=0.009$).
- The difference between raw scores on the self-care domain of the PEDI ($F_{(1)} = 4.68, p=0.04$) approached statistical significance at 1 month ($p=0.08$) and 6 months ($p=0.06$), again in favour of the treatment group. Reviewer calculated (Herbert, 2000) 95% confidence interval of the mean PEDI change at six months was -0.43 to +8.69.
- No significant differences were found for the modified Ashworth scale, grip strength or passive range of motion.
- There was a decrease in spasticity for both the intervention and control groups over the study period.
- No side effects of the BtA injections were reported with the exception of 1 child who had temporarily reduced grip strength.

Original Authors' conclusion

- BtA injections improve the quality of upper extremity movement and function of children with hemiplegic cerebral palsy
- Improvements were evident for up to 6 months post injection
- Both groups demonstrated a decline in spasticity

Critical Appraisal:**Validity**

- Methodological quality as rated using the PEDro scale = 8/11
- Clear inclusion criteria, randomisation, objective outcome measurement, minimal drop outs and appropriate statistical analyses
- No detail provided regarding the occupational therapy intervention which limited the review of this element.
- No variability data provided for the primary outcome (QUEST).

Interpretation of Results

While the group of children receiving BtA showed a statistically significant improvement in QUEST scores, the clinical importance of this is questionable. Few functional tasks require weight bearing on the upper limbs and improvement in this area is unlikely to lead to increased social participation in older children. The results of the PEDI could be of greater clinical importance. However, the reviewer calculated confidence interval (Herbert, 2000) for the change in raw scores of the self care domain at six months (mean diff: 4.13; 95%CI: -0.43 to +8.69) does not include the clinically important difference of 11 points as suggested by previous research (Iyer, Haley, Watkins, & Dumas, 2003).

Summary/Conclusion:

Promising results of improved upper limb quality and trends for increased performance in self care tasks following BtA plus occupational therapy.

Table 3d: Description and appraisal single subject design study by McGibbon Lammi & Law, 2003.

Aim/Objective of the study:

To investigate whether an adapted version of Family Centred Functional Therapy (FCFT) with a focus on changes to components of a task and/or the environment of a functional task improved the performance of pre-school aged children with cerebral palsy.

Study Design: Single subject, multiple baseline design with two case repetitions.

Setting: Paediatric rehabilitation centre in Canada

Participants:

All recruited from caseloads of two paediatric occupational therapists.

Inclusion criteria

- Children aged 3 – 6 years
- Diagnosis of cerebral palsy
- Level III on Gross Motor Function Classification System

Recruited

- Four initially recruited, one dropped out
- Remaining three participants were aged 3 years to 3 years 6 months
- 2 boys, one girl

Intervention Investigated

- Intervention followed the four FCFT principles of promoting function, identifying periods of change (transition), identifying the primary constraints in the task, child or environment and providing opportunity for practice.
- This study aimed to only address constraints in the task or environment, not child.
- Three tasks, identified by parents, that were thought to be in transition and satisfying to the child, were chosen for intervention.
- Tasks included independent play, self-feeding, donning shoes or pants and pencil use.
- Task performance was videotaped and analysed to identify task or environmental constraints. Strategies were devised to overcome the constraints.
- If no response to a strategy was observed another strategy was devised.
- The most simple strategies (and least invasive to the family routine) were tried before more complex strategies.

Outcome Measures

- Three tasks were identified by parents for each child using the Canadian Occupational Performance Measure (COPM).
- Two tasks were treated and one was used as a control task.
- The COPM was used to assess pre/post intervention task performance (scores range 1 – 10) and satisfaction (scores range 1 -10).
- Parents used the COPM to rate task performance daily. Daily ratings occurred for 46, 47 or 61 days in total, with baseline periods ranging from 14 to 16 days.
- The caregiver assistance scale of the Pediatric Evaluation of Disability Inventory (PEDI) was used to rate independence pre and post intervention.
- The Performance Quality Rating Scale (PQRS) was used assess quality of performance and overall achievement of each task pre and post intervention. Ratings were made by a therapist blind to the intervention and order of assessment from videotapes of the child's performance. PQRS is a six point rating scale where 0 = no and 5 = all activity criteria achieved
- Following the initial assessment with the COPM, PEDI and videotape for PQRS, a baseline period of at least 14 days for the first task and 21 days for the second task ensued.

Daily COPM baseline measures were completed until performance was deemed stable i.e. fluctuations of no more than 15% beyond the mean.

- Intervention for task one began on about day 14 and about day 30 for task 2. No intervention was provided for task 3. Intervention continued until performance was stable.
- Data were analysed visually using graphs, determination of serial dependency was undertaken and if not present, linear regression was used to measure change in performance. If serial dependency was present celeration lines were used to analyse changes between treatment phases. Rules for determining whether change had occurred were clear.
- Pre – post intervention changes were evaluated using the COPM (2 points difference was deemed clinically significant), PEDI and PQRS. Raw scores were provided to determine direction and amount of change.

Main Findings:

- The primary outcome – daily ratings on the COPM, showed an increase in performance scores in at least one of the two tasks targeted for treatment. Child 2 improved in both tasks and Child 2 & 3 also showed improvement in the control task.
- Pre – post intervention changes on COPM performance and satisfaction scores for the 2 intervention tasks ranged from 1 – 7; Child 1 & 2 had clinically important changes on two tasks (both performance and satisfaction). Child 3 showed only a 1 point change in performance for one task and satisfaction for the other task. Clinically important changes were also found for Child 1 in the control task.
- PQRS scores for Child 1 showed only a 1 point improvement in one task, a four point improvement in one task for Child 2 and 1 and 2 point changes in two tasks for Child 3.
- The self care domain of the PEDI improved by 5, 8, and 9 points for each child respectively. The mobility domain remained stable in all children and the social function domain was stable for two children and decreased in Child 2 by 3 points.

Original Authors' Conclusions

The study was found to support the usefulness of FCFT. The authors suggested that an initial focus on changing the task or environment to promote task achievement may be a simpler and more economical approach to the treatment of children with cerebral palsy.

Critical Appraisal:

Validity

- Methodologically strong single case design, using repeated measures to establish stable performance in both baseline and intervention phases. Analyses processes for repeated measures were clearly described and appropriate.
- While an overall description of FCFT therapy was provided in the introduction, no explicit examples of intervention strategies were provided.

Interpretation of Results

- Positive results were found for all three children on at least one task along with strong trends for a reduction in caregiver assistance in self-care tasks following the intervention period.

Summary/Conclusion:

This study used a single subject design which is rated as Level IV evidence (NHMRC, 2000). Single subject designs are considered to be highly effective in evaluating complex and variable conditions such as cerebral palsy as has been discussed by the Treatment Outcomes Committee of the American Academy of Cerebral Palsy and Developmental Medicine (Butler et al., 2005). Whilst the objective was to determine whether FCFT interventions would improve task performance, two of the outcome measures used, the PEDI and the COPM, allowed the authors to examine and show that the children increased their independence from care givers and that parents' were satisfied with their child's ability to perform tasks. These outcomes can be interpreted as relating to social participation, the focus of this review.

IMPLICATIONS FOR PRACTICE, EDUCATION and FUTURE RESEARCH

The complex clinical question posed for this review resulted in a search for answers from a variety of types of sources. The four studies included had quite different methodologies all of which had some design limitations. Given the many differences between the studies, it is difficult to compare them to one another directly. However, the overall key finding was that there was little or no evidence to support that occupational therapy interventions that improve upper limb function also enhance social participation for children with cerebral palsy.

The goals of a child with a disability are the same as those of any other child: to have friends and to be included in everyday activities (G. King et al., 1999; G. King et al., 2002). However, disabilities can limit the activity choices of children and restrict their ability to participate with their peers (King et al., 1999). Children with cerebral palsy are no exception. The movement and postural dysfunction associated with the condition often results in "limited participation in social activities, causing isolation, emotional and social problems in children themselves and their families" (Chen & Cohn, 2003, p. 61).

In recent times, there has been growing literature to support social participation as an important outcome for children with cerebral palsy. Majnemer & Mazer (2004) reported that there has been a shift in research trends from quantitatively measuring motor impairments to including elements of health and well-being. Despite this claim, the articles identified for inclusion in this review failed to address social participation sufficiently. The systematic review by Steultjens et al. (2003) was the only article found that identified and sought 'social participation' as an outcome; these authors were unable to locate any trials that measured this concept. The remaining three articles addressed participation at the activity level, focusing on activities of daily living, particularly self care tasks and independence from care givers. Our findings, and those of Steultjens et al. (2003), are consistent with claims by Cardol, De Jong and Ward (2002) that participation "is seldom evaluated either in treatment or in outcome assessment" (p.970) despite the growing literature to suggest otherwise.

One explanation for the lack of social participation as a measured outcome is limited availability of an appropriate, reliable and valid measurement tool. Until recently, social participation was difficult to measure; however, there are now at least two tools available to do this effectively. The Assessment of Life Habits (Life-H) was developed by Noreau et al. in 2002 specifically for the purpose of evaluating a person's social participation. 'Life habits' is a term that refers to a person's daily activities and social roles. Disruptions in the accomplishment of life habits often results in a restriction of social participation (Noreau, Fougereyrollas, & Vincent, 2002). A number of components of the original Life-H are irrelevant for children so it has recently been adapted to suit a younger population. The paediatric Life-H is currently being examined for reliability and validity (Noreau et al., 2002).

The Children's Assessment of Participation and Enjoyment (CAPE) which is used in conjunction with a companion measure, the Preferences for Activities of Children (PAC) is also now available (G. King et al., 2004). The CAPE measures five dimensions of participation: diversity, intensity, and enjoyment, with whom and where (which provides a context) (King et al., 2004). Both the CAPE and PAC are self-reported with the CAPE addressing the day to day activities of children and youth and the PAC providing additional information about children's activity preferences. Initial reliability and validity studies of the CAPE and PAC demonstrate sufficient internal consistency, test-retest reliability, content validity and construct validity (King et al., 2004).

Clinical Implications

Traditionally, rehabilitation approaches have concentrated on reducing the child's impairment and improving motor ability (Majnemer & Mazer, 2004). In addition to the WHO's focus on participation, the Canadian Model of Occupational Therapy (CAOT, 2002) also demonstrates and values the enablement of occupational performance across all domains of life. This review found limited evidence to support that FCFT increased social participation,

and that BtA plus occupational therapy increased upper limb performance that might increase social participation. Therefore, from this evidence, clinicians must consider the benefits of including FCFT as an intervention for improving social participation for children with cerebral palsy. FCFT is a new approach that not only looks at the physical capacities of a child with cerebral palsy but also targets the child's environment and the purposeful goals of the family and the child (McGibbon Lammi & Law, 2003).

Occupational therapy interventions that focus on upper limb function should continue to be both researched and applied in clinical practice as improving motor ability remains an important outcome for children with cerebral palsy. However, it is likely to also be necessary to address social participation directly; particularly if a direct causal link between improved upper limb function and social participation is not established.

There is some suggestion that clinical practice has already begun to incorporate the newly published CAPE/PAC in order to more directly target participation as both an outcome and an intervention focus. Furthermore, clinicians report adopting a goal directed approach in practice which reflects the theory of occupational therapy (CAOT, 2002) and the revised ICF model (WHO, 2001). The Goal Attainment Scale (GAS) (Kiresuk, Smith, & Cardillo, 1994) and the Canadian Occupational Performance Measure (Law, Baptiste et al., 1998) are commonly used assessments in paediatric occupational therapy to negotiate client goals. This top-down approach allows occupational therapists to prioritize the issues for both the family and the child. However, one difficulty with these assessments is that they are not suitable for use with younger children. Instead, parents are asked to identify areas of difficulty and evaluate change, often producing different priorities between the child and the parents. A new assessment, the Perceived Efficacy and Goal Setting System (PEGS) (Missiuna, Pollock, & Law, 2004) can be used to establish goals in younger children between the ages of 6-9 years.

Future research

There is a significant amount of literature exploring the impact of cerebral palsy on occupational and social participation (WHO, 1997; King et al., 1999; Chen & Cohn, 2003; Majnemer & Mazer, 2004; Levitt, 2004; Cardol, 2004). The literature highlights the fact that children with cerebral palsy and their parents rate social participation as of great importance (King et al., 1999; King et al., 2002; Hemmingson, Borell & Gustavsson, 2003; Chen & Cohn, 2003), unfortunately research including social participation as an outcome of intervention is limited (Steultjens, 2003; Cardol, 2004).

It is apparent that there is a growing body of research into upper limb interventions and a paucity including social participation as a measured outcome. Given this, research investigating whether the improvement of upper limb function does impact on social participation for children with cerebral palsy is required. It is important to establish this link between upper limb function and social participation as it would provide sound foundation for clinical practice. It is also recommended that future research be focused on specific elements of social participation; for example, social participation at school, in sporting clubs or in leisure time. The focus of future research into social participation should be related to the goals of children with cerebral palsy, where possible, rather than those of their parents and caregivers.

It must be acknowledged that there are currently two studies in progress that are consistent with the recommendations outlined above. Majnemer, Shevell, Law & Rosenbaum (2003-2005) are investigating the determinants of life quality in children with cerebral palsy (CanChild, 2005). A second study is looking at the "participation of children with disabilities" (Law et al., CanChild, 2005).

Conclusion

With the evidence currently available, the clinical question cannot be answered definitively. The articles reviewed suggested that some occupational therapy interventions, including serial casting or BtA injections combined with occupational therapy and Family Centred Functional Therapy can improve the upper limb function of children with cerebral palsy and allow them to better perform some activities of daily living. As increased upper limb

function may lead to greater participation, it is possible that occupational therapy interventions to improve upper limb function can indeed enhance the social participation of children with cerebral palsy, but this is yet to be demonstrated empirically.

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