Interaction training for conversational partners of children with cerebral palsy: a systematic review

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Abstract

Background: Research has shown that children with cerebral palsy have difficulties acquiring communication skills and that conversation with familiar partners follows restricted patterns, which are characterized by high levels of partner control and children’s responsivity. Speech and language therapy often includes training for conversational partners to help them recognize children’s communicative signals and to create opportunities for children to take a more equal and independent role in conversation. However, the effectiveness of this indirect therapy has not been demonstrated reliably.

Aims: To review systematically all experimental research on communication training for conversational partners of children with cerebral palsy and to evaluate the effectiveness of this type of intervention.

Methods & Procedures: As part of a wider review, health, psychology and education electronic databases were searched up to December 2002 for reports of experimental studies on the training of conversational partners to facilitate the communication of children with cerebral palsy, which contained an element of control. References from identified studies were followed-up and relevant journals and conference reports were hand-searched. Identified studies were assessed for inclusion by the first author. Two reviewers independently abstracted data on the quality and content of each study.

Outcomes & Results: Four studies were identified from five research reports that met the criteria for inclusion in the review, comprising three group studies and one single case experiment. Common targets for training were observed across the studies. These included positioning of the conversational partner and child for interaction, creating communication opportunities and responding to children’s communicative signals. Changes were observed in the conversation.

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patterns used by conversational partners, which should facilitate the communication of children with cerebral palsy. However, the studies contain methodological flaws and as a result they cannot demonstrate that the changes were definitely a result of the intervention.

**Conclusions:** Research on the effectiveness of interaction training for conversational partners of children with cerebral palsy is in its early stages. Training has incorporated common targets, which are widely acknowledged by clinicians to affect the communication of children with motor disorders. Trends in behaviour change have been suggested by research to date, but further studies that address the methodological inadequacies of the original research are needed to evaluate the effectiveness of this type of intervention. Suggestions of ways to improve the design and reporting of future studies, that will allow the mapping of interventions to clients, are discussed in this review.

**Keywords:** cerebral palsy, children, parental training, conversational partners, systematic review, effectiveness.

**Introduction**

Many children with cerebral palsy (CP) experience communication difficulties because their motor impairments affect the range, speed, strength and consistency of movements needed to produce speech, gestures and facial expression. In addition to their motor impairments, children with CP also often experience language disorders, epilepsy, cognitive and sensory impairments (e.g. Aicardi and Bax 1992), which also impact on communication and its development. From child to child, impairments associated with cerebral palsy differ in their severity and consequent effect on communication development, creating heterogeneity in the clinical population. This inherent variation, coupled with differences in children’s communication environments, means that children with the same medical diagnosis vary widely in their language and communication development. Speech and language therapy is therefore tailored to meet the individual’s needs and can focus on any aspect of speech, language and communication acquisition (in addition to issues of dysphagia, which are beyond the scope of this present paper). Research on interventions for children with cerebral palsy reflects this diversity.

In spite of such heterogeneity, common patterns in communication have been observed for children with cerebral palsy who differ in age, cognitive level and motor function. The most well-reported patterns concern the development of pragmatic skills and children’s functional communication, which are often severely affected.

Research has shown that infants with CP initiate less in interactions with their parents, are less responsive and less independent than children following the typical pattern of development matched for developmental age, and that their parents control interactions using verbal and physical directives (Hanzlik and Stevenson 1986, Hanzlik 1990). It is possible that this pattern of interaction develops due to infants’ difficulties in producing movements quickly and accurately. The establishment of early communication depends on the production of consistent, readable non-verbal and vocal signals by children that parents or caregivers can recognize and respond to thereby setting up early interaction routines onto which meaning is
mapped (Bruner 1973, 1975, Goldberg 1977, Bates et al. 1979, Snow 1984). If parents can only recognize one or two signals, then they may establish routines in which the child can produce these signals so that interaction can proceed smoothly. However, it may then become difficult for children to acquire a full range of communication skills and to take an active independent role in interaction (Pennington and McConachie 1999).

Research has shown that older children with CP, including those with cognitive skills within normal limits, those whose speech is intelligible with minimal contextual cues, and those provided with augmentative communication systems to supplement natural communication, show the same restricted patterns in conversation with familiar partners as younger children with the same diagnosis. They respond to others’ topics, questions, comments and directives as their partners direct conversations (e.g. Light et al. 1985a, b, Jolleff et al. 1992, Pennington and McConachie 2001), and hence take a responsive role in social and educational interaction. Models of therapy have been developed to address these communication patterns. The models involve teaching children new linguistic and pragmatic skills (e.g. Hunt et al. 1990, Buzolich et al. 1991, Letto et al. 1994, Pinder and Olswang 1995). They also include indirect therapy, training conversation partners to adapt their interaction style and to stimulate the child’s communication development (e.g. Culp and Carlisle 1988, Pennington et al. 1993).

A body of research on intervention focusing directly on children has been developed over the last two decades and is the subject a wider systematic review (Pennington et al. 2003). However, the effects of training for conversation partners have received less research attention. Parents of children with cerebral palsy have been included with parents of young children with other developmental disabilities, in training programmes on early interaction skills (e.g. Mahoney and Powell 1988, Tannock et al. 1992, Hemmeter and Kaiser 1994). These programmes aim to teach parents to become more responsive to their child’s communication, provide communication opportunities and extend linguistic output. They have been associated with positive changes in parental interaction that should facilitate children’s communication development, but their effects for parents and their children with CP have not been specifically evaluated. Training programmes have also been developed for parents and other conversational partners of children with severe motor speech impairments (many of whom have CP) who use augmentative and alternative communication (AAC) systems (e.g. Culp and Carlisle 1988, Pennington et al. 1993). Some have shown positive outcomes in development trials (Pennington and McConachie 1996, McConachie and Pennington 1997). However, at this early stage in research, it is not clear if one particular type of training is most suitable for conversational partners of children with CP or if different types are suitable for different points in intervention. For example, one type of training might be most appropriate for parents rather than teachers, or a particular type of training might work best at a certain stage in children’s lives or for conversational partners of children who show specific patterns of speech/language/communication development.

This review was undertaken to investigate the models of training of conversational partners of children with CP reported to date, and their relative effectiveness in changing partners’ interaction style and developing children’s communication skills. It also aimed to evaluate if certain models of training were more effective than others, and if individual models could be mapped to carers of
children from various subgroups. As the review concerned the effectiveness of interventions, observational studies, which cannot show associations between intervention and behaviour change, were excluded.

Methods

Searches

Searches were made to find research reports that met all of the following criteria:

- Subjects were conversational partners of children aged 0–19 years who had a communication disorder associated with a medical diagnosis of CP. The severity of children’s motor, cognitive, speech, language, communication or sensory impairments did not affect inclusion.
- Intervention comprised training that aimed to change conversational partners’ interaction style and to help them facilitate children’s communication development. Topics included in the training could target any aspect of children’s communication. For example, speech production, positioning for communication, language development, use of AAC. Training could take place on a one to basis or in a group, and be given in any location.
- Studies included some element of experimental control. For example group studies in which one group received intervention and another did not, groups receiving different training, and single cases in which one behaviour was trained and another was not trained and acted as a control.

Searches were made of the following electronic databases up to December 2002: MEDLINE (from 1966); CINAHL (from 1982); EMBASE (from 1980); Psych Info (from 1967); Web of Science (from 1990); Language and Linguistic Behaviour Abstracts (from 1973); British Education Index (from 1986); National Research Register (completed and ongoing research); ERIC (from 1966); Aslib Index to UK theses (from 1970); and SIGLE (from 1980). The search terms used were ‘cerebral palsy’ and ‘child’, with any of the following: speech, speech disorder, speech intelligibility, speech therapy, speech and language therapy, speech pathology, language, language disorders, language development disorders, sign language, child language, language therapy, communication, communication aids for disabled, communication disorders, communication methods, total or manual communication, or non-verbal communication.

Hearing in Schools. (The current titles are given for journals experiencing name changes since 1980.)


Reference lists of all studies selected for possible inclusion were checked for other possible eligible studies. Authors of included trials were contacted for unpublished studies. Calls for assistance were also made via national professional associations.

Procedure

The first author conducted all searches. Full texts of all reports that appeared to meet the three criteria were examined. Studies definitely meeting the three criteria were included in the review, those whose inclusion status was unclear were discussed by all authors and agreement reached. Studies selected for inclusion were assessed for methodological quality, and data on the subjects, interventions and results were extracted using tools developed for the review as follows. Two authors (L.P. and J.G. or L.P. and J.G.) independently reviewed each of the included studies. Disagreements were resolved with the third author. The methodological quality of group studies was assessed in terms of the method of subject allocation to group, concealment of group allocation, inclusion criteria, similarity of groups, sample size, blinding of assessors, protocol compliance, missing values and loss of subjects to follow-up. Coding criteria were taken from Reviews and Dissemination Report Number 4 (CRD 2001), criteria different to those used in the report are given in appendix A. The methodological quality of single-case experimental designs was rated on description of the subject and intervention, blinding of the assessor, suitability of the control behaviour, assignment of behaviour to intervention or control, baseline adequacy, duration of treatment and follow-up and frequency of measurement across the phases of the experiment (see Appendix A).

Results

Searches identified five research reports that met all three criteria for inclusion in the review. Four were group studies and one reported a single case experiment. Of the four group studies, two reported results from one original study (Pennington and McConachie 1996, McConachie and Pennington 1997). Only McConachie and Pennington (1997) is included in the review as it contains the results discussed in the previous paper in a different format.

The design of the individual studies, the subjects included, the training given and their outcomes are summarized in table 1.

Summary of studies

As can be seen from table 1, the studies differed in the subjects they included and the interventions they assessed.
### Table 1. Studies included in the review

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of subjects</th>
<th>Description of target children</th>
<th>Duration and location of training</th>
<th>Content of training</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| Basil (1992), controlled before and after study | Four experimental subjects: three mothers, one father. No other information Control subjects were teachers. Number not stated | *n:* four Spanish children with cerebral palsy.  
Age: 7.4–8.8 years.  
Gender: three girls, one boy.  
Motor skills: no independent mobility, upper limbs severely affected.  
Cognition: one child 4.5 years cognitive age, other children did not reach baseline on cognitive tests.  
Sensory skills: not specified.  
Receptive language: RA 3–5 years.  
Communication: facial expression, vocalization, eye gaze and single symbol messages on Picture Communication Symbol boards. A total of 52–188 symbols available to each child | One group training session in rehabilitation centre, followed by three home visits. No information on duration and frequency of sessions. Controls received no training | Using communication boards, children’s methods of selecting symbols, reducing own speech rate, prompting AAC use, asking open questions, increasing responses to child’s communication | No difference between the percentage of turns taken in conversation, or the proportion of responses to children’s utterances by trained parents or untrained teachers before and after intervention. Parents asked fewer open questions than teachers before therapy, but increased these after training whilst teachers’ use of open questions remained stable  
\[ F(3,1) = 8.35, p = 0.063. \]  
Before parent training, children failed to respond to parents’ interaction more often than to teachers’, but increased their responses to parents after intervention  
\[ F(3,1) = 17.94, p = 0.024. \]  
Children also communicated less often using their symbol communication boards with their parents than with their teachers, but increased their use with after training  
\[ F(3,1) = 16.93, p = 0.026. \] |
Table 1. (Continued)

<table>
<thead>
<tr>
<th>Study</th>
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<th>Duration and location of training</th>
<th>Content of training</th>
<th>Outcomes</th>
</tr>
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</table>
| Hanzlik (1989), randomized controlled trial | Ten mothers in experimental group, four high school graduates, five trade school or partial college education one college graduate. Ten mothers in control group: six high school graduates, two trade school or partial college education, one college graduate. Maternal employment not stated. None had received previous training on interaction or neurodevelopmental therapy. | Experimental: *n* = 10
  - **Gender:** eighth boys, two girls.
  - **Age:** mean age 16 months (8–25);
  - **Motor skills:** seven quadriplegia, two hemiplegia, one diplegia; one severe, four moderate–severe, three moderate, two mild cp.
  - **Cognition:** mean mental age 9 months (2–18).
  - **Sensory skills:** children with severe sensory impairments excluded.
  - **Receptive language:** not stated.
  - **Communication:** not described.

  Controls: *n* = 10
  - **Gender:** six boys, four girls.
  - **Age:** mean age 19 months (9–92).
  - **Motor skills:** five quadriplegia, three hemiplegia, two diplegia; two severe, two moderate–severe, four moderate, four mild.
  - **Cognition:** mean mental age 9 months (3–15).
  - **Sensory skills:** Children with severe sensory impairments excluded.
  - **Receptive language:** not stated.
  - **Communication:** not described.

<p>|                                   | Experimental: one home visit of 1 hour duration. Control: one home visit of 1 hour. | Experimental: verbal instruction from therapist on turn taking, increasing responsiveness, increasing face to face contact, reducing directiveness and therapeutic holding. Mothers practised techniques in session and were given handout. Control: demonstrations of techniques to inhibit abnormal tone and promote normal movement, practise with therapist, handout given. | After intervention mothers in the experimental group used less physical guidance (<em>F</em> (1,18) = 6.34, <em>p</em> = 0.02), more face to face contacts (<em>F</em> (1,18) = 28.49, <em>p</em> = 0.00005) and less physical contact (<em>F</em> (1,18) = 10.11, <em>p</em> = 0.005) than mothers in the control group. No differences were observed in mothers’ verbal directiveness, praise, questions or verbal interaction before and after instruction for either group. Infants from the experimental group showed an increase in voluntary responsiveness (<em>F</em> (1,18) = 11.53, <em>p</em> &lt; 0.003) and less physically directed compliance (<em>F</em> (1,18) = 4.44, <em>p</em> &lt; 0.05) but no differences in the amount of independent play. |</p>
<table>
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<tr>
<th>Study</th>
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<th>Duration and location of training</th>
<th>Content of training</th>
<th>Outcomes</th>
</tr>
</thead>
</table>
| McCollum (1984), single case experimental design.  
Multiple baseline across two conditions | One mother. Single parent, lower middle income.  
Used neutral tone in interaction.  
Rarely engaged child in interaction.  
No other information given | *n:* 1  
**Gender:** Male.  
**Age:** 18 months.  
**Motor skills:** Severe cerebral palsy, type not specified.  
**Cognition:** not specified.  
**Sensory skills:** not specified.  
**Receptive language:** not specified.  
**Communication:** vocalized, but showed few social behaviours | Ten weekly home visits. Duration not specified. | Taught to move face closer to child’s (target 1) and to imitate child’s vocalization (target 2) in play without toys. | From baseline mother increased the number of time she brought her face closer to her child and maintained the behaviour after intervention had finished. Imitation of her child’s vocalisation increased during intervention but showed a lot of variation, and a possible downward trend towards the end of treatment. The skills appeared to generalize to an untreated play situation, but were not maintained after therapy. The infant also increased his vocalization when his mother did so in training. |
| McConachie and Pennington (1997), controlled before and after study | Experimental: 19: nine teachers, 10 teaching assistants.  
Control, 14: eighth teachers, six assistants.  
Subjects matched on gender, occupation and extent of contact with child. No other information given | *n:* 9  
**Gender:** five male, four female.  
**Age:** 7–17 years.  
**Motor skills:** six mixed type, two dystonic, one spastic type cp. Severity of cp not specified  
**Cognition:** not specified.  
**Sensory skills:** not specified.  
**Receptive language:** not specified.  
**Communication:** all used low tech symbol AAC systems, 175–1000+ symbols available. Two children also used voice output communication aids | Experimental: Five 90-min sessions at school given over 10–12 weeks. Controls: no training | Experimental: My Turn to Speak training: effects of position on function, methods of access, creating opportunities for interaction, negotiating communication breakdown, planning for communication development. Controls: no training | Teachers and educational assistants who received training used more strategies to facilitate children’s communication four months after training ($\chi^2 (4) = 15.84, p \leq 0.01$), but no overall differences after 1 month. Post-hoc analysis suggested that differences were observed for teachers at 1 month post-training, but not for assistants ($\chi^2 (4) = 11.82, p < 0.01$). Control teachers and assistants showed no change in their interaction patterns. Secondary outcomes for children were not measured |
Subjects

For three studies (McCollum 1984, Hanzlik 1989, Basil 1992), the conversation partners trained were parents, all but one of whom were mothers. McConachie and Pennington trained teachers and educational assistants. With the exception of subjects in the study by Hanzlik (1989), conversational partners are very poorly described. The target children with whom the subjects interacted ranged in age from 8 months to 17 years, with two studies including parents of infants (McCollum 1984, Hanzlik 1989) and two including partners of school-aged AAC users (Basil 1992, McConachie and Pennington 1997). Target children varied in the type and severity of their cerebral palsy and their cognitive development. Other areas of development, including linguistic skills, are poorly described in each of the studies.

Intervention

The training provided in the studies ranged from 1 hour to approximately 7 hours 30 minutes. Most of the training was given by the speech and language therapist on a one-to-one basis in the subject's home, except in McConachie and Pennington (1997), who undertook group training at school where subjects worked. McCollum (1984) and Hanzlik (1989) both trained parents on early interaction strategies, including increasing responsiveness, face-to-face contact and imitation and reducing directiveness. Basil (1992) and McConachie and Pennington (1997) trained conversation partners to facilitate the communication of AAC users, with common topics such as positioning, asking open questions and prompting AAC use.

Results

Positive changes in the interaction strategies of trained conversation partners were observed in each of the individual studies. Untrained partners were shown not to change. For Hanzlik (1989), the short training was associated with changes in the physical components of conversation, with mothers physically directing their children less and increasing face-to-face contacts. For training of a longer duration, changes were observed in verbal strategies, such as increasing open questions (e.g. Basil 1992). Secondary outcomes were reported for children whose partners were trained in the studies by Basil (1992), Hanzlik (1989) and McCollum (1984), with increases observed in infants' voluntary responsiveness and vocalisation.

As the studies included in the review investigated different interventions and used different measurement tools data were not combined in a meta-analysis.

Methodological quality of studies

Issues pertaining to the methodological quality of the individual studies included in the review are summarized in tables 2 and 3.

As can be seen from tables 2 and 3, studies included in the review contained at least one of the following methodological problems:

- Lack of random allocation of subjects to group and concealment of group allocation, leaving studies open to selection bias.
<table>
<thead>
<tr>
<th>Study</th>
<th>Assignment of subjects to group</th>
<th>Group allocation concealed</th>
<th>Inclusion criteria specified</th>
<th>Groups similar</th>
<th>Sample size calculated, adequate</th>
<th>Blinding of assessor</th>
<th>Protocol clarity and compliance (see Appendix A)</th>
<th>Missing values</th>
<th>Loss to follow-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basil (1992)</td>
<td>Not random, allocated by author</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td>Partial. Author assessed and gave intervention Coding reliability checked with blind rater using non-random sample of 12.5% sessions from before, during and after therapy, with agreement 90, 92, 98%</td>
<td>Protocol unclear, could not be replicated reliably</td>
<td>none</td>
<td>unclear</td>
</tr>
<tr>
<td>Hanzlik (1989)</td>
<td>Quasi-random, allocation pulled from a hat for each subject entering study, until all places allocated</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>no</td>
<td>Partial. Author gave treatment and assessed children. Coding agreement checked. $K=0.75–1.0$ agreement across 14 categories (good-excellent, Barlow and Hersen 1984). Used data from each subject but did not state the amount of data used</td>
<td>Could be replicated partially</td>
<td>none</td>
<td>none</td>
</tr>
<tr>
<td>McConachie and Pennington (1997)</td>
<td>Not random. Allocated by school management on staff availability</td>
<td>Partially (see blinding)</td>
<td>no</td>
<td>unclear</td>
<td>no</td>
<td>Half of results assessed by second author, who delivered training. Other half assessed by blind rater. Reliability check undertaken on 15% of the total data 76% agreement (71–79%)</td>
<td>Published protocol, could be replicated. Compliance not discussed</td>
<td>None</td>
<td>Poor</td>
</tr>
<tr>
<td>Study</td>
<td>Subject description</td>
<td>Intervention description</td>
<td>Blinding of assessor</td>
<td>Suitability of control</td>
<td>Assignment of process to treatment/ control</td>
<td>Baseline</td>
<td>Intervention phase</td>
<td>Follow-up</td>
<td>Measurement</td>
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</tr>
<tr>
<td>McCollum (1984)</td>
<td>Inadequate</td>
<td>Partial replication possible</td>
<td>No reliability of coding checked with data from subjects not involved in the research</td>
<td>Adequate</td>
<td>Not random</td>
<td>Adequate</td>
<td>Adequate</td>
<td>Inadequate measured once only for follow-up</td>
<td>Partial measured once only for follow-up</td>
</tr>
</tbody>
</table>

Table 3. Methodological quality of single case experimental design study
- Poor description of subjects and lack of eligibility criteria (with the exception of Hanzlik 1989).
- Small sample size, unlikely to reflect the population or to detect a true difference between groups. In single case insufficient measurements to confirm a true trend.
- Lack of blinding of assessors, with the possibility of detection bias.
- Description of intervention did not always allow replication.
- Multiple testing of data, increasing the chance of finding a difference between groups by chance.
- Validity of measurement tools was not reported.
- Lack of follow-up to show maintenance of new communication behaviours.

Discussion

The results of the review show that at present research on the effectiveness of training for conversation partners of children with CP is in its early stages. Five studies were identified that investigated the effects of training on early interaction for parents of infants with CP (McCollum 1984, Hanzlik 1989) and on facilitating the communication of school age AAC users for parents and educators (Basil 1992, Pennington and McConachie 1996, McConachie and Pennington 1997). Pennington and McConachie (1996) included some of the subjects from McConachie and Pennington (1997), reporting data in a different form and so this study is excluded from this discussion.

The two studies that trained parents of infants with CP (McCollum 1984, Hanzlik 1989) concentrated on similar early interaction strategies, such as increasing parents’ responsiveness, imitations and face-to-face contact. These targets have been well described in early interaction research and have been the subject of interventions for children with other developmental disabilities (e.g. Kaiser et al. 1996, Yoder and Warren 1999, 2001). Hanzlik’s (1989) study provides evidence that training for parents can lead to immediate changes in parent–child interaction. With 1 hour of verbal instruction, practice and feedback from a therapist, parents were helped to change the physical structure of interaction, using less physical direction and guidance and increased face-to-face communication. Furthermore, parents’ verbal interaction was rated as more positive after training. However, individual verbal strategies to encourage children’s communication did not change. Further testing of the intervention used is warranted to investigate if increased number of therapy sessions can change less tangible verbal interaction strategies as well as the more easily observed strategies relating to physical positioning. Longer-term follow-up should also be undertaken to evaluate the impact on interaction change and on communication development by children, as the original study only included data being collected only once after intervention.

Hanzlik (1989) specified entry criteria, allocated subjects to experimental and control groups using a quasi-random method and described subjects fully, showing that the two groups were similar. It is therefore unlikely that the post-training differences observed between the experimental and control groups are due to pretreatment differences or subject selection, and readers can infer that treatment led to the changes in interaction observed for parents and their infants. Other studies included in the review had methodological flaws that prevent such
inferences being made, even though trends in behaviour change seem to be emerging.

In McCollum (1984), the mother and child studied and the intervention used were poorly described, variation in treated behaviours were observed throughout each phase and the phases were of short duration (three to four sessions). The study would have been improved by in-depth description, an increased number of sessions in each phase and the use of randomization tests, which do not require a stable baseline (Todman and Dugard 2001). The two studies identified that examined the effects of training conversational partners to facilitate the communication of school-aged AAC users (Basil 1992, McConachie and Pennington 1997) also gave very brief descriptions of their subjects. These two group studies also lack entry criteria and random allocation to groups, contain small sample sizes, and do not show that treated and control subjects were similar before intervention, leaving them open to selection bias that could account for the differences between subjects and controls observed after treatment. However, as the interventions tested were developed from previous basic research and accord with clinical practice (e.g. Blackstone and Bruskin 1986, Lloyd 1997, Light and Binger 1998), further research is needed to evaluate fairly their effectiveness, using designs that address the original studies’ methodological limitations.

The studies in this review included only conversational partners of children with CP; partners of children with other diagnoses were excluded. Other studies have investigated the effects of early interventions for parents of children with a range of developmental disabilities who are at risk of communication disorders, and have included parents of children with CP (e.g. Mahoney and Powell 1988, Tannock et al. 1992, Hemmeter and Kaiser 1994). These studies have shown some evidence of positive interaction change, have targeted interaction patterns associated with communication development, and evaluate interventions that are widely used. However, the studies were excluded from this review because the results for parents of children with CP cannot be separated out whilst maintaining an element of control. Thus, we cannot draw conclusions about the effects of the interventions for this subgroup. Investigation of the suitability of these programmes for parents of children with CP is therefore needed.

**Implications for future research**

The studies included in this review each have an element of control and are theoretically able to show the effects of treatment for their subjects. However, with the exception of Hanzlik (1989), each study contains several methodological weaknesses that prevent readers concluding that the interventions led to communication change. Further studies are needed to evaluate the effectiveness of current generic training for conversational partners of children with CP, to test the effects of varying components of that training, to evaluate published interventions specifically with parents of children with CP and to test new interventions.

To retest the current interventions developed by Basil (1992) and McConachie and Pennington (1997), rigorous small group studies are needed. As well as providing preliminary information on possible treatment effects, such studies could also provide information on natural variation in communication behaviours across subjects and the possible size of change expected following therapy. If outcomes of
the preliminary trials were positive, such data could then be used to calculate how many subjects would be needed in a definitive trial of the effectiveness of the generic training and to evaluate the feasibility of conducting such a trial (MRC 2000 for further discussion). However, it may become clear from sample size calculations and prevalence data that it would not be possible to conduct a randomized controlled trial, and quasi-experimental designs would be warranted (Cook and Campbell 1979).

If the effectiveness of generic training programmes was demonstrated in rigorous group studies, the outcome of altering treatment components could be investigated to ensure that the training provided was the most efficient. Small group designs and case series could be used to evaluate the effects of altering the components of intervention, for example changing the duration and frequency of treatment or the teaching methods used. If positive outcomes were observed in such studies, the comparative effectiveness of the new and standard treatment (based on Hanzlik 1989, Basil 1992, McConachie and Pennington 1997) could be tested in pragmatic trials with random allocation of subjects to groups or in quasi-experiments if subject recruitment was limited.

This model of research, moving from case series to group studies could also begin to test the effectiveness of interventions when extended to new groups of conversational partners. For example, using the training developed by Hanzlik (1989) with parents of older children with CP, and evaluating schemes developed for parents of children with developmental disabilities (e.g. Mahoney and Powell 1988, Tannock et al. 1992, Hemmeter and Kaiser 1994) specifically with parents of children with CP. Radically new training programmes for conversational partners should be tested in single case experimental designs and using case series to replicate treatment. For training focusing on generic patterns of conversation the single cases may again lead to small group designs and further testing. It is possible, however, due to the heterogeneity of children with cerebral palsy, that training on some areas of interaction for conversational partners may not be generalizable and intervention will be significantly different for each partner trained. In such cases, single case experimental designs will be the only option for testing intervention effectiveness. It is important, however, that single cases do incorporate an element of experimental control, as without this researchers cannot argue that the intervention led to any communication changes observed (e.g. Kazdin 1982, McReynolds and Kearns 1983, Barlow and Hersen 1984).

Whether studies are seeking to evaluate the effectiveness of interventions for individuals or groups of conversational partners future studies would be strengthened by the following:

- Defining subject selection criteria, thereby facilitating interpretation of results and replication of the treatment with similar clients (Higginbotham and Bedrosian 1995, Bedrosian 1999, 2003).
- Detailed description of subjects. For conversational partners, information on their relationship to the target child, extent of contact, communicative style, previous interaction training, age, gender and educational level should be given. For children descriptors should include age, gender, type and severity of cerebral palsy, gross and fine motor function, cognitive skills, presence of epilepsy, receptive and expressive language skills, speech intelligibility, and current communicative level (Bedrosian 1999, Sevcik et al. 1999).
Use of a set of standard set of measures, using the same or similar tests, to describe subjects and their interaction behaviours. This would permit comparison of subjects across studies, evaluation of the effectiveness of different interventions, and in time, the mapping of interventions to clients (Sevcik et al. 1999).

Detailed description of interventions, giving teaching methods, duration and frequency of sessions, which would allow their replication. In addition, information on fidelity of treatment with the protocol would allow decisions to be made about an intervention's suitability and effectiveness (Schlosser 2002, 2003). Treatment fidelity data should include measures of how closely treatment given accorded with treatment plans and instructions. Variability within treatment may be associated with response to treatment and prevent conclusions from being drawn about the effectiveness of the intervention. Treatment fidelity information could also indicate if an intervention were clinically manageable and acceptable. For example, if 20 sessions were planned but only 14 were carried out, this may account for lack of change in communication but may also indicate that the treatment is not acceptable to subjects or possible in current clinical conditions.

Blind assessment of outcome measures to prevent detection bias. When funding does not allow blind assessment of outcomes, a second assessor must code a significant proportion of data from each subject and each phase of the study. The second assessor should be blind to when the data were collected and whether the subject (in a group design) or the behaviour coded (in a single subject design) received treatment.

Minimal number of outcome measures to show behaviour change. Using multiple tests on the same set of data increases the chance of finding difference between groups.

Investigation of generalization of treatment effects to non-treated communication environments/conversation strategies (Schlosser and Braun 1994).

Follow-up of subjects to examine interaction change and communication skill acquisition (Schlosser and Braun 1994).

Group designs would also be strengthened by random allocation to groups, where appropriate, which would minimize selection bias and allow authors to show that treatment, not features of the subjects within a group, was responsible for communication change.

In addition to testing the effectiveness of interventions developed for individuals or for generic groups, future research also needs to evaluate the value and acceptability of treatments to children and their families (Light 1999, Schlosser 1999). When developing and testing new interventions, researchers should include an investigation of whether the intervention is wholly acceptable and desired by clients and families, or if it should be changed or abandoned. There is obviously little merit in an intervention that works but is unacceptable. Qualitative methodologies would provide the detailed information needed to adapt and refine interventions and their delivery. Using both quantitative and qualitative research methodologies, we showed if and how interaction training offered to the conversational partners of infants and children with cerebral palsy by speech and language therapists is effective and acceptable.
Conclusions

The studies included in this review suggest that there may be an association between interaction training for conversational partners of infants and older children with CP, and changes in communication style for both the people trained and the children with whom they interact. However, research on the outcomes of training for conversational partners is at a very early stage and does not yet provide hard evidence for the effectiveness of the interventions developed to date. Further research is needed to address the methodological issues raised in this review and to evaluate fairly any effects of current training schemes. Future research should also involve refining training for partners to its most effective and efficient components and methods of provision, mapping training components to client groups and ensuring that training offered meets clients’ needs as they define them.

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Appendix A: Coding of the methodological quality of included studies

For group studies coding followed CRD Report Number 4, 2nd edn (CRD 2001) with the following exceptions.

Eligibility criteria specified: age, IQ, LA, cp type and severity, communication level, previous therapy, ed. level, communication mode, intelligibility, gender. Adequate: eligibility criteria fit with aims of study and are defined in terms of study aims. No confounding variables. Inadequate: loose criteria, not related to study aims. Unknown: criteria not defined in report.

Baseline characteristics: need to be able to see which subjects were recruited. Should be able to estimate prognosis. Adequate: information on severity and type of cp, CA, IQ/DQ, presence and severity of additional impairments, SES/parental education, present communicative level. Inadequate: some, but not all, of the above, present functioning and severity of cp not established. Unknown: information on subjects not given.

Sample size calculated: Adequate: sample size calculated from previous research with outcome measures used in present study Unknown: sample size not discussed.

Outcome assessors blind to treatment allocation: Adequate: person assessing outcome is unaware of aims of treatment and allocation of subject to treatment group. Inadequate: clinician is the assessor. Unknown: no statements made and not deducible.

Compliance with protocol: Frequency of sessions, percentage of sessions occurring, attendance, measurement of compliance with ‘homework’ tasks.
Adequate: sessions recorded, all undertaken, high levels of attendance recorded, handing in of homework tasks. Partial: diary of activities completed by subjects with number of sessions and attendance recorded. Inadequate: self-report of homework activities or approximate number of sessions and attendance by therapists. Unknown: not mentioned.

For single case studies the following criteria were used:

**Subject description:** Adequate: includes all information. Partial: includes some information, but not all needed for replication. Inadequate: scant details, e.g. age and gender.

**Treatment description:** Adequate: therapy is replicable. Partial: could replicate, with some guesswork, or using previous descriptions. Inadequate: therapy not described, cannot be replicated.

**Assessor blind:** Adequate: assessor blind to therapy aims and intervention time. Partial: may be aware of whether subject had received treatment. Inadequate: clinician carried out assessments.

**Processes similar:** Adequate: two early or late developing skills. Inadequate: early and late developing skill paired together.

**Assignment to treatment:** Adequate: computer generated, done by blind third party, coin tossing. Inadequate: alternate allocation. Unknown: no information.

**Baseline:** Adequate: stable baseline, no upward trend, consistent over at least three measures. Inadequate: upward trend, less than three stable measures.

**Treatment phase:** Adequate: skill shows development which is maintained over a period of at least three measures, plateau observed across at least three measures, may reach ceiling on measure. Inadequate: upward or downward trend continuing, no plateau, not clear if skill still changing.

**Follow-up phase:** Adequate: phases of equal length showing clear patterns of behaviour, with possibility of change. Inadequate: follow-up period brief, change may still be occurring.

**Measures:** Adequate: measures taken frequently across baseline, treatment and follow-up. Partial: measures taken frequently during intervention, and at multiple times in baseline and follow-up but less frequently than intervention. Inadequate: measures taken infrequently, only one of two measures taken at follow-up.

**Confounding variables:** Adequate: confounding variables accounted for and discussed. Inadequate: confounder alluded to in description, but not discussed in terms of impact on behaviour. Unknown: possible confounding variables not mentioned in the text.

**Replication criteria:** Adequate: all information needed for replication given. Partial: some but not all information given, subjects seem similar. Inadequate: not enough information given for replication, subjects may not be similar.

**Replication subjects:** Adequate: subjects appear similar in terms of prognosis. Inadequate: subject differ in important ways, likely to react to treatment differently.

References


LIGHT, J., 1999, Do augmentative and alternative communication interventions really make a


Schlosser, R. W., 2002, On the importance of being earnest about treatment integrity. AAC: Augmentative and Alternative Communication, 18, 36–44.


**Excluded studies**


