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ABSTRACT

Purpose: To investigate whether It Takes Two to Talk—The Hanen Program for Parents of Preschool Children With Cerebral Palsy is associated with change in interaction between children who have motor disorders and their parents.

Method: Eleven children aged 19–36 months who had nonprogressive motor disorders that affected their communication, and their mothers, were observed 4 months and 1 month before mothers attended It Takes Two to Talk training, and 1 month and 4 months after its completion.

Results: Interaction patterns were stable prior to training. After training, mothers initiated less and produced more responses and fewer requests. Children produced more initiations, as well as more requests and provisions of information, after training. Mothers' linguistic input did not change in amount or complexity. Changes were maintained 4 months later. Mothers' views of parenting did not change.

Conclusions: It Takes Two to Talk may be associated with positive communication change for this group. Further investigation of its clinical effectiveness is warranted.

Effects of It Takes Two to Talk – The Hanen Program$^{®}$ for Parents of Preschool

Children with Cerebral Palsy: Findings from an Exploratory Study

Children with congenital motor disorders, the most common cause of which is

cerebral palsy (Koman, Smith, & Shilt, 2004), often have problems acquiring and controlling

movements for facial expression, gesture and speech. Movements may lack precision, vary in

onset time, and be produced differently on different occasions (Wright, Hunt, & Stanley,

2001), making communication signals difficult to interpret. Children's motor speech disorders

range from mild, with slight slurring of articulation and/or harsh voice quality, to profound,

with complete inability to produce any recognizable words out of context.

Interaction between children with cerebral palsy and other motor disorders (hereafter

"children with cerebral palsy") and their familiar communication partners often differs from

that involving children following the typical pattern of development. Conversations are used

to meet to a particular purpose, rather than for general discussion or chat (Ferm, Ahlsen, &

Bjorck-Akesson, 2005; Hjelmquist & Dahlgren-Sandberg, 1996). Conversation partners have

been observed to control conversation, possibly in an attempt to prevent communication

breakdown when they have difficulties understanding children's communication signals

(Dunst, 1985; Tannock and Girolametto, 1992). They take more turns in conversation than the

children (Pennington & McConachie, 1999; von Tetzchner & Martinsen, 1996), introduce

most topics, and use high levels of questions and commands (Light, Collier, & Parnes, 1985a,

1985b; Pennington & McConachie, 1999; von Tetzchner & Martinsen, 1996). The children

take a mainly respondent role, ignoring nonobligatory turns and rarely initiating

conversational exchanges (Jolleff et al., 1992; Light et al., 1985a; Pennington & McConachie,

1999). They also use their communication for a restricted range of functions; producing

mainly 'yes' and 'no' answers, acknowledgements, and simple requests for, and provisions of

information about, objects within view (Clarke & Kirton, 2003; Light et al., 1985b;

McConachie & Ciccognani, 1995; Pennington & McConachie, 1999; Romski, Sevcik, Reumann, & Pate, 1989). Similar interaction patterns are observed for preschool children through young adults, and for children with varying severities of speech disorder (Lund & Light, 2007a; Pennington & McConachie, 2001a).

Such restricted patterns of communication limit children's social participation (Dickinson et al., 2007) and reduce their full access to education and later employment. The aim of speech-language pathology is to help children maximize their communication skills and take as active and independent a role in conversation as they can. Interventions can focus on maximizing children's intelligibility, by working on speech production (Fox, 2004; Pennington, Smallman, & Farrier, 2006) or by introducing augmentative and alternative communication (AAC) systems. However, increased intelligibility does not automatically change interaction patterns and children may need to be taught how to become independent in communication using any or all of the modes they have available (Jolleff et al., 1992). This may include teaching children how to start and develop conversations (Lund & Light, 2007a) and how to produce signals to express a wider range of communicative functions/convey particular intentions, such as to make a request or to repair conversation (e.g. Brady, 2000; Buzolich, King, & Baroody, 1991; Halle, Brady, & Drasgow, 2004; Johnston, McDonnell, Nelson, & Magnavito, 2003; Lancioni et al., 2006; Light, Binger, Agate, & Ramsay, 1999; Pinder & Olswang, 1995; Sigafoos & Roberts-Pennell, 1999). Requests, especially, give communicators power to control their environment and increase independence and are often the focus of interventions (Schlosser & Sigafoos, 2002).

Intervention may also involve children's parents, peers and education staff. Partner-focused intervention is based on the transactional theory of development, which proposes that both the child and their conversation partners continuously adapt to each other's behaviors (Sameroff & Feise, 2000). Communication partners are taught why children with cerebral

palsy have specific difficulties in producing quick and replicable movements for communication, how fast paced conversation might prevent children from making initiations, and how to recognize children's varying and idiosyncratic communication signals (Basil, 1992; MacDonald & Gillette, 1988; McConachie & Pennington, 1997; Pennington & McConachie, 1996). Partners are also taught to change their own behaviors to accommodate the slow communication of children with cerebral palsy and to promote children's active engagement in and control of conversation. This includes creating opportunities for children to initiate conversation (Basil, 1992; Light, Dattilo, English, Gutierrez, & Hartz, 1992; Schepis & Reid, 1995), use new vocabulary to expand their topics of conversation (McConachie & Pennington, 1997; Pennington & McConachie, 1996), and express communicative functions that promote independence, such as asking questions or making requests to direct activities. Partners of children who use AAC might also be taught how the AAC system works and the tasks involved in creating messages via this communication mode. Partner training is now an integral and effective method of intervention in AAC (e.g. Kent-Walsh & McNaughton, 2005; Lund & Light, 2007b; Pennington, Goldbart, & Marshall, 2003; Sevcik, Romski, & Adamson, 2004).

Parent Training in Early Intervention

The partner training described above was developed specifically for partners of children who have motor disorders. Training has also been developed for parents of very young children who have more generalized developmental disabilities and language and communication delays. This training too has focused on helping parents to adopt a more responsive approach to interaction. For example, observing their children closely for signs of communication and following the child's lead, teaching them to stimulate children's communication by structuring conversation and the physical environment, and coaching them to prompt the production of specific linguistic and nonverbal communication targets.

Examples of training schemes include It Takes Two to Talk – The Hanen Parent Program (Girolametto, Greenberg, & Manolson, 1986; Manolson, 1992; Pepper, Weitzman, & McDade, 2004); the Transactional Intervention Program (Mahoney & Powell, 1986); Milieu Teaching (Kaiser, Alpert, Hemmeter, & Ostrosky, 1987) and Responsivity Education / Milieu Teaching (Yoder & Warren, 2002). Programs featuring responsive interaction training have been associated with more balanced turn taking between parents and children with developmental disabilities and fewer directive, topic controlling behaviors and more contingent responses being produced by parents (Girolametto, 1988a; Mahoney & Powell, 1988; Tannock, Girolametto, & Siegel, 1992; Yoder & Warren, 2002). As predicted by the transactional model of development (Sameroff & Feise, 2000), parents' increased responsiveness has been accompanied by children becoming more active in interaction, taking more turns, ignoring fewer turn opportunities, producing more comments and increasing the diversity of their vocabulary (Girolametto, 1988a; Mahoney & Powell, 1988; Tannock et al., 1992; Yoder & Warren, 1998, 2002). Milieu teaching and an adaption of the Hanen training with focused language stimulation have also helped parents to teach their children to produce target linguistic messages (Girolametto, Pearce, & Weitzman, 1996; Hancock, Kaiser, & Delaney, 2002; Hemmeter & Kaiser, 1994; Kaiser, Hemmeter, Ostrosky, Alpert, & Hancock, 1995; Kaiser et al., 1996; Yoder & Warren, 2002). Parents who have received this type of training have also been observed to adapt the conversational environment, give more positive feedback and generalize their use of milieu teaching techniques in conversation with their children following training.

Early parent training may also have an impact on the amount and the complexity of language directed toward children. Following a social interaction theory of communication development, parents' use of simplified language, which the children can understand, will help children to attend to and make connections between the language and environment, for

example objects, actions and emotional states (Cross, 1981; Harris, Jones, Brookes, & Grant, 1986; Rocissano & Yatchmink, 1983; Snow & Ferguson, 1978). Simplification of language is included in responsive interaction teaching; for example, in the Hanen program It Takes Two to Talk, parents are encouraged to "say less and stress" (Pepper & Weitzman, 2004). Girolametto, Pearce and Siegel (1996) found that training parents to teach specific vocabulary targets to children in It Takes Two to Talk was associated with reductions in maternal MLU and words per minute.

Effects for Parents of Children with Cerebral Palsy

As the early intervention programs above are similar to those developed for children with motor disorders in that they focus on the recognition and understanding of children's communication and reduction of parental conversational control, they may also be effective for parents of young children with cerebral palsy. Providing training early in children's lives may help develop sound building blocks for later communication interventions tailored to the individual and specific needs of children with cerebral palsy (Pennington & Thomson, 2007). To date research into the effectiveness of these early intervention programs has included children with milder motor disorders and their parents, but individual results cannot be disaggregated from group findings. We cannot be sure if the training is effective for parents of children with wide ranging motor impairments, who may show very different and often idiosyncratic patterns of communication development.

We set out to investigate the potential outcomes of early generic interaction training for parents of young children with cerebral palsy. We aimed to discover if the training might be effective with this group of families, who have specific communication needs, and to gauge whether the general effectiveness of the training should be investigated for this group in a randomized controlled trial. We chose to use It Takes Two to Talk – The Hanen Program® in our research because it shares topics with training shown to be successful with

older children with cerebral palsy who use AAC, focusing on responsive interaction training without targeting linguistic output and teaching parents to wait for and recognize children's idiosyncratic communication signals. Furthermore, it is used widely with parents of children with developmental disabilities in the UK, has evidence of effectiveness for families of the broader group of children with developmental disabilities and children with cerebral palsy were included in its original research (Girolametto, 1988b; Tannock et al., 1992). We investigated changes in communication patterns for parents and children. In this exploratory study we also included a measure of parents' perceptions of their skills in parenting to quantify possible negative effects of parent intervention. Reductions in warmth and expressiveness by parents have been observed following parent training (Mahoney & Powell, 1988) along with equivocal outcomes for parental stress (Brinker, Seifer, & Sameroff, 1994; Fey et al, 2006; Robertson & Weismer, 1999; Shonkoff, Hauser-Cram, Krauss, & Upshur, 1992; Tannock et al., 1992).

Primary Research Questions

As research and clinical practice highlights the particular difficulties children with cerebral palsy have in assuming an active, independent role in interaction our main research question concerned communication patterns between parents and children:

Is It Takes Two to Talk associated with positive communication change for parents and their children with cerebral palsy?

We predicted that following It Takes Two to Talk training mothers would assume less control over the conversation and children would take more control. Specifically: following intervention (a) mothers would initiate less and use more responses; (b) children would initiate more and produce fewer responses; (c) mothers would produce fewer requests for joint attention, requests for objects and actions, requests for known and unknown information, which direct the conversation; and (d) children would use more directive requests and

provisions of information (which develop, control and extend the topic of conversation), and fewer simple acknowledgements, yes and no answers and physical responses (which contribute little to the development of conversational topic).

Secondary Research Questions

Research also suggests that parent training programs may affect change in parents' language use and stress levels. We therefore asked two supplementary questions:

Is It Takes Two to Talk associated with change in the complexity of mothers' language to their children with cerebral palsy?

We investigated the amount and complexity of language mothers used to their children in the number of words spoken per minute, utterances per minute, utterances per turn, and MLU. Following Girolametto et al (1996), we predicted that these variables would decrease after intervention.

Is It Takes Two to Talk associated with change in mothers' perceptions of their skills in parenting?

As the research in this area is equivocal we had no predictions about change in mothers' perceptions of their own skills as parents following training. It is possible that It Takes Two to Talk training could strengthen parents' self belief, as they develop knowledge about communication development and apply this to their own child, especially if they see positive changes in their child's communication. However, it is also possible that focusing on their own interaction in It Takes Two to Talk may lead parents to become critical of their own actions and increase their anxiety about their ability to do their best for their child and foster their child's development (Dunst, 1999).

Method

Participants

We recruited 11 families to the study via speech-language pathologists. Nine families

lived in the north east, north west or south east of England. Two families lived in South

Australia. As the locations shared similar models of service provision and cultural values it

was decided that it was appropriate to have two recruitment areas for this study. In order to

recruit children with wide ranging motor impairments, reflecting the population of children

with cerebral palsy and children referred to speech-language pathology clinics, children were

eligible for the study if they: (a) had been referred to speech-language pathology services, and

had (b) nonprogressive motor disorders affecting at least two limbs and expressive

communication, (c) vision that was within normal limits or correctable by glasses, (d) hearing

that had been assessed via neonatal screening or audiological assessment and judged adequate

for speech perception without amplification by their pediatrician, and (e) parent report of

response to spoken words and phrases appropriate to the situation (e.g. turning to the door

when hearing a car and mother saying "Daddy's home"). In this preliminary study we

excluded families who spoke English as a second or additional language, due to the

differences in language development for bilingual speakers (Li Wei, 2000) and the lack of

evidence for the effectiveness of It Takes Two to Talk for families of minority cultures in

England and South Australia. We also excluded families who had previously attended It

Takes Two to Talk training.

At the start of the study the children (3 girls, 8 boys) were aged between 1;7 and 3;0

years ($M = 2;2$, $SD = 0;5$). Ten children had cerebral palsy, one child had a myopathy. Type

and distribution of motor disorders varied and resulting impairments in children's gross and

fine motor function and speech production skills ranged from mild to severe. For example,

one child walked short distances with a definite limp and was easily unbalanced, could use

one hand well, and had dysarthric speech that had recently become intelligible in single CVC

words in context. Another child was unable to sit unsupported, was able to point to objects

and produce a few limited gestures, and was able to produce vocalizations only. All children

had a history of severe delay in reaching their gross and fine motor milestones and had communication difficulties associated with their motor disorder.

Children's gross motor function at the time of joining the study was rated by their physiotherapists using the Gross Motor Function Classification System (Palisano et al., 1997). On this five-point rating scheme 1 indicates minimal gross motor impairment, 5 indicates profound impairment. Most children scored in the midrange (*Mdn* = 3, interquartile range (IQR) = 2–5), indicating that they required assistance to sit, could creep/crawl, cruise short distances, and walk short distances with assistance. Physiotherapists also rated children's upper limb function, using a scale developed for previous interaction research (Pennington & McConachie, 2001b). To aid comparison with the GMFCS we reversed the scoring from that previously published: 5 = no purposeful movement observed in either limb, 1 = minimal problem with bimanual tasks. Most children had some difficulty using two hands together, but could bring both hands together to act on a toy (*Mdn* = 3, IQR = 3–4).

Following the first visit to families the researcher rated children's spoken output using the five-point Speech Production Rating Scale (Pennington & McConachie, 2001b), which was developed to describe the severity of speech impairment in cerebral palsy. Again to facilitate comparison with the GMFCS, this scale has been reversed. 1 = Following normal pattern of speech production development; 2 = Most consonants produced in single words, speech impaired but mainly intelligible to unfamiliar adults out of context; 3 = Consonants restricted in range, intelligible to familiar adults at single word level, mostly unintelligible to unfamiliar adults without contextual cues; 4 = Speech severely impaired, mainly unintelligible to familiar adults without contextual cues; 5 = Vocalizations only, mostly unintelligible to familiar adults without contextual cues. Most children had severe to profound dysarthria and their spoken output consisted of open vowels only (*Mdn* = 5, IQR = 4–5). Children used a range of modes to express their communication signals, including body movement

(nonsymbolic), gesture (including facial expression), vocalization, speech and AAC.

Children's expressive vocabulary was measured using the British English adaptation of the MacArthur Communicative Developmental Inventory: Toddlers Scale (CDI) (Klee, Marr, Robertson, & Harrison, 1999), in which parents were asked to report any words that the children were able to convey consistently by speech, vocalization and/or body movements without contextual cues (Mdn = 21, IQR = 3–58). Children's verbal and nonverbal comprehension was assessed using standardized tests. The administration procedures of these tests were adapted for children with motor impairments (Pennington & McConachie, 1999, 2001a). Children could complete the assessments by eye/hand pointing towards objects and their intended destinations. Methods of response were trialed prior to test administration. If the tester was unsure of a child's response during test administration the item was repeated. If a second response was unclear the item was marked as failed. Although the tests give indications of the children's functioning results should be interpreted with caution as tests were not standardized on populations including children with cerebral palsy. We assessed comprehension of spoken language using the Preschool Language Scales UK edition (Zimmerman et al., 1997) (M = 6.27 percentile, SD = 9.57, range 1–34) and nonverbal comprehension using the Visual Receptive scale of the Mullen Scales of Early Learning (Mullen, 1995) (M = 6.36 percentile, SD = 6.83, range 1–14).

Six participants were only children, three had older siblings and two had younger siblings. Two of the children lived in single parent families and resided with their mothers. Five mothers had completed high school education, three had completed some further education but had not graduated from university, and three had completed university degrees. Five mothers worked outside the home, four on a part-time basis. The families lived in urban and rural areas. UK children lived in areas that ranged from moderately deprived to moderately affluent, measuring 5 to -5 on UK Townsend scores, in which values greater than

0 indicate deprivation (Townsend, Phillimore, & Beattie, 1988). Australian families lived in areas slightly above, or within one standard deviation of the mean, using the Australian Index of Relative Disadvantage. All families were White British or White Australian.

Materials

We used a brightly colored box of toys to elicit parent-child interaction. Toys included a doll, a teddy, a toy brush, two spoons, two forks, two cups, a story book, a wordless book, a noise maker, two push along cars, magnetic blocks and a sheet of stickers. Preliminary testing with children aged 1;6 to 3;0 years, some of whom had intellectual impairment, showed that the toys appealed to children of a wide developmental age range and could sustain children's and parents' attention for ten minutes. To measure the value mothers place on parenting and their perceived skills as parents we asked mothers to complete the Parenting Sense of Competence Scale (PSOC) (Gibaud-Wallston & Wandersman, 1978), a 16-item five point Likert scale that has been used with families of disabled children (Hassall, Rose, & McDonald, 2005; Walker, Van Slyke, & Newbrough, 1992). In the PSOC parents rate the extent to which they agree with nine statements relating to the value they place on being a parent, such as 'My mother was better prepared to be a good mother than I am'; and eight items relating to their skills as parents, such as 'If anyone can find the answer to what is troubling my child, I can'.

Design

We used a quasi-experimental design in which data from mothers and children were compared pairwise across four data collection points. Data were collected at two points prior to parents attending It Takes Two to Talk training, to measure change in communication patterns without parent training, and at two points after training to assess the effects of the intervention. In this repeated measures design children and mothers acted as their own controls.

Procedure

The research was approved by Trent Multicentre Research Ethics Committee and local

service providers in England, and by the ethics committee of the Women's and Children's

Hospital, Adelaide, South Australia. Nine speech-language pathologists, from six service

providers in England and one provider in South Australia, recruited families to the study and

led It Takes Two to Talk® the Hanen Program in their local areas. All clinicians were

registered to provide It Takes Two to Talk by the Hanen Centre and usually ran one program

per year for parents of children with developmental disabilities in their locality. Clinicians

grouped families according to similarities in children's communication development and

delivered training at a time convenient for most parents who wished to attend. Parents

recruited to the research attended the orientation session and the training sessions for It Takes

Two to Talk with other parents whose children had developmental disabilities but who did not

fit the criteria for the study. Transport costs and child care were offered by the research to

families fitting the research criteria and to the other families attending the training along with

them. Training followed that described by Girolametto and Weitzman (2007) and specified by

Pepper, Weitzman and McDade (2004). Specifically, the training comprised seven or eight

150-minute group sessions and three home visits over approximately thirteen weeks (*M*

=12.58, *SD* = 2.71). In the group sessions a variety of teaching methods were used to convey

information to parents and encourage active learning (e.g. short talks, demonstrations, role

play, appraising interaction on the It Takes Two to Talk training video and videos of parents

on the course), as described in the Making Hanen Happen Leaders' Guide (Pepper et al.,

2004). All parents received a copy of the parents' guide It Takes Two to Talk (Pepper and

Weitzman, 2004). In the home visits clinicians made videos of parents and children

interacting, which were used for individual coaching of parents in the subsequent home visit,

as described in Girolametto and Weitzman (2007). Most families attended all sessions of the

training program, although sessions were missed due to family illness and unexpected

breakdown in child care arrangements (*M* = 7.52, *SD* = 1.08).

Families were asked to nominate one caregiver to take part in the study; all nominated

were mothers. We visited families at home on four occasions to collect data for the study:

Time 1, four months before parents attended It Takes Two to Talk; Time 2, one month prior

to training; Time 3, one month after training completion; and Time 4, four months after

completion. One child was ill, and no data could be collected, at Time 4. During each visit we

video-taped mothers and children for ten minutes playing with the box of toys. Before giving

them the box, we asked mothers to play and talk and as they usually did. We started the

video-recording and then placed the closed box between the mothers and children. Children

sat independently on the floor or at a table in their special seating whilst playing. One child

sat in her mother's lap as she did not yet have a specialized seating system but could not sit

unsupported. We did not tell the mothers where to sit during the video-recording. All sat

opposite or next to their child with the toys between them. In each visit mothers completed

the PSOC after the video-recording.

Coding of Parent-Child Interaction

We transcribed and coded video-recorded interaction to show the structure of

conversation and the pragmatic functions expressed by mothers and children. We used a

coding scheme previously applied to interaction involving children with cerebral palsy and

their mothers (Pennington & McConachie, 1999, 2001a) which is based on the discourse

analysis method developed by Sinclair and Coulthard (1992) and Francis and Hunston (1992),

work with children at early stages of communication development by Gallagher (1981) and

Wetherby, Cain, Yonclas and Walker (1988), and research with children who use AAC by

Light et al (1985b). In this scheme conversation is segmented moves, which show the

structure of conversation, and functions which denote the speaker's intention i.e. the purpose

of the communication. The *moves* allowed in the present scheme are initiations, response-initiations, responses, follow-ups, and no responses (Light et al., 1985b; Pennington & McConachie, 1999, 2001a). The *pragmatic function* of each move in the conversation, other than no responses, is represented as: request for joint attention, request for objects or actions, request for information (split into request for known and unknown information for mothers only to separate test from real questions), request for clarification, provision of information, provision of clarification, acknowledgement, confirmation or denial, expression of self, behave, and unintelligible. When a move expresses more than one function we code the function to which the listener was intended to respond. Definitions and examples of codes are given in the appendix.

For example:

	Move	Pragmatic function
Parent: 'Hey. Look in here.'	Initiation	Request for joint attention
Child: 'Pens?'	Response-initiation	Request for information
Parent: 'Yes, there are pens.'	Response	Provision of information
Parent: 'Which color do you want?'	Initiation	Request for information
Child: (*looks out of window*)	No Response	
Parent: 'Do you want to draw?'	Initiation	Request for information
Child: (*nods*)	Response	Confirmation
Parent: 'OK' (*gives pen to child*)	Follow-up	Acknowledgement

Coding Maternal Language Input

We coded maternal language using the Systematic Analysis of Language Transcripts (Miller & Chapman, 1992). Like Girolametto, Pearce and Wietzman (1996), we calculated mothers' talkativeness (utterances per minute, words per minute) and the complexity of their linguistic input (utterances per turn, MLU in morphemes).

Data Analysis

We calculated the frequencies of moves and functions produced by mothers and children at each data collection point. We compared *frequencies* of total numbers of communication behaviors (moves and functions) at different data collection points using Wilcoxon signed ranks tests. As some mothers, and children, within the sample produced more communication behaviors than others, and different upper limits were placed on the number of communication signals produced by children's movement disorders, we calculated *proportions* of individual moves and functions from the total number of moves/functions produced by each participant at each data collection point (Light et al., 1985a, 1985b; Lund & Light, 2007a; Pennington & McConachie, 2001a; Yont, Snow, & Vernon-Feagans, 2003). The proportions allowed us to investigate change in the composition of conversation and patterns of behavior for mother-child pairs independent of frequency of communication, but restricted the number of comparisons which could be made due to the correlational nature of proportional data. With this analysis plan we could examine not only if rate of communication changed, but also if the overall pattern of communication differed in terms of the *relative* use of individual moves and functions judged as clinically important from previous research. For example, we could examine if more communication behaviors were produced by children following parent training and if more requests were produced over and above that accounted for by a change in rate. Distributions of the individual move and function proportions for mothers and children were observed to be positively or negatively skewed and were transformed to reduce skewness using natural logs.

To answer the primary research questions of whether mothers and children changed in their use of different types of pragmatic functions we formed three composite functions. For mothers we formed 'maternal directives' by adding together requests for joint attention, requests for objects and actions, requests for known and unknown information. For children

we formed a 'control' function, which comprised functions that allowed children to take an active role in conversation: requests for joint attention, action/object and information and provisions of information; and 'comply' from their acknowledgements, 'yes' and 'no' answers and physical responses.

To answer each research question we undertook pairwise comparisons to compare Time 1 data with Time 2 data, Time 2 with Time 3, and Time 3 with Time 4. We compared log-transformed move and function proportions using repeated measures *t* tests. To test our prior hypotheses that some move and function proportions would increase and some would decrease immediately after training we used one-sided tests. We used two-sided tests when comparing Time 1 with Time 2 and Time 3 with Time 4, as we predicted that prior to intervention behaviors would not change and we could not predict what would occur to communication following intervention. Differences in the number of different functions used by children, PSOC scores and maternal language variables derived from SALT were calculated using repeated measures Wilcoxon signed ranks tests. As recommended for clinical trials (Sankoh, D'Agostino, & Huque, 2003; Schulz & Grimes, 2005) we used an alpha level of .05 when testing primary research questions and Bonferroni adjusted levels of significance for post hoc comparisons of move and function data and when comparing maternal language measures and PSOC scores for the secondary research questions. We also calculated the mean effect size of the intervention on the individual tests using Cohen's *d* (Cohen, 1988).

Inter-rater agreement

We selected two minutes from each of the ten-minute recordings of mother-child interaction to use in the calculation of inter-rater coding agreement. The two minutes started at a randomly selected minute from 0–8. For each two minute clip a second researcher, who was blind to the first researcher's coding decisions, used the transcript of the interaction and the video-recording to code the moves produced by mothers and children and the functions

expressed within the moves. A total of 3049 moves and 2615 functions were coded by either or both researchers in the agreement corpus (mothers' moves = 1630, children's moves = 1419, mothers' functions = 1576, children's functions = 1039). Agreement between researchers was calculated using Cohen's kappa, which corrects for chance agreement (Cohen, 1960). Excellent agreement between raters was observed for mothers' moves (κ = .76, p = <.01), children's moves (κ = .78, p = <.01), mothers' functions (κ = .75, p = <.01), and children's functions (κ = .77, p = <.01). Percentage agreement for individual moves and functions is shown in Table 1. Differences in behaviors with agreement less than 70% were excluded from the analyses with the exception of children's requests for objects/actions, which were coded by the second rater as requests for objects/actions or requests for joint attention or information. As this group of functions was treated as a composite requests for objects/actions were retained for the analysis. We randomly selected a separate 90-second section of interaction from each recording for inter-rater agreement of SALT coding of mothers' data. The second rater undertook the coding blind to the first researcher's coding decisions. Agreement was high: utterance per turn, r = .489, p <.001; MLU morphemes r = .982, <.001. Words and utterances per minute were calculated from timings on transcripts and the agreement check used only sections of the transcripts. Therefore, these data were not included in the reliability check. One of the recordings for each child was rated on the Speech Production Rating Scale by the two raters blind to each other's coding, r = .773, p <.001.

<div align="center">Results</div>

Mother-Child Interaction Patterns: Structural Moves

The total number of moves varied between mothers (*Mdn* = 137, IQR = 100-138 at Time 1), but paired Wilcoxon signed ranks tests showed no difference in the number of moves used by individual mothers at the four data collection points. The number of moves produced by children also varied (*Mdn* = 121, IQR = 77-140 at Time 1), but again no

difference was observed in paired comparisons.

Mean move percentages showed that before It Takes Two to Talk interaction was highly unequal in terms of the types of moves used by mothers and children. As shown in Table 2, at Time 1 mothers used high proportions of initiations and low proportions of responses, whereas children produced large numbers of responses and no responses and few initiating behaviors. We predicted that after intervention mothers would produce proportionally fewer initiations and more response moves, and that children would produce more initiations and fewer responses.

Analysis showed no differences between mother-child interaction patterns at Time 1 (four months prior to training) and at Time 2 (in the month prior to training), when children were receiving their usual speech-language pathology services (Table 3). At Time 3, in the month following training, mothers used higher proportions of responses than at Time 2, $t(10)$ = 3.891, p = .002, d = 1.173, and lower proportions of initiations $t(10)$ = -2.730, p = .011, d = -.823 (at a main effect significance level of .05). Mean move proportions in Table 3 suggested an increase in mothers' use of follow-ups after training, but this was not significant in post hoc analysis with Bonferroni adjusted significance level p< .002. No change was observed in mothers' initiations and response move proportions from Time 3 to Time 4.

Table 3 shows that children's moves partially followed the predicted pattern of change following intervention. They produced higher proportions of initiations at Time 3 than Time 2, $t(10)$ = 3.150, p = .005, d = .950. But, proportions of responses showed no change. It appeared that children's follow-up moves increased following It Takes Two to Talk and their no responses decreased, but post hoc analysis with Bonferroni adjustment of significance levels showed no change. No difference in children's initiation and response move proportions were observed from Time 3 to Time 4.

Pragmatic Functions

The total number of functions varied between mothers at Time 1 (*Mdn* = 132, IQR = 100-155), but paired Wilcoxon signed ranks tests showed no difference in the number of moves used at the four data collection points by individuals. The total number of functions produced by children also varied at Time 1 (*Mdn* = 90, IQR = 65-108), but again no difference was observed between data points in paired comparisons.

The mean proportions of functions produced in mother-child interaction at Time 1 showed very different patterns for use of individual functions by mothers and children. As shown in Table 4, approximately 60% of mothers' moves contained request functions and 35% of moves were coded as provisions of information and acknowledgements. Children, on the other hand, produced high levels of provisions of information, confirmations, denials, expressions of self, and physical responses (behave), with only approximately 15% of moves being coded as expressing requests.

The pattern of pragmatic functions used by mothers and children did not differ between Time 1 and Time 2. As predicted, mothers produced proportionally fewer directives following intervention, $t(10) = -2.630$, $p = .013$, $d = -.793$ (Table 5). No difference was observed in maternal directives produced at Time 3 and Time 4. We hypothesized that following parent training children would become more directive and active in conversation, using higher proportions of the composite 'control' function and lower proportions of 'comply'. As shown in Table 5 we found a significant overall change in control, $t(10) = 2.987$, $p = .007$, $d = .901$, but no differences in comply. No difference was observed in the functions used by children from Time 3 to Time 4.

Maternal Language Input

We predicted that following training mothers would simplify and reduce the amount of language input to their children, reducing the number of words spoken per minute, utterances per minute, utterances per turn, and MLU. However, no such differences were

observed. Descriptive data are shown in Table 6.

Mothers' Views of Parenting

At Time 1 mothers' scores on PSOC varied on both the skills section (*Mdn* = 27.00, IQR 24.25−31.00), and the value section (*Mdn* = 34.50, IQR 32.75−37.50). No differences on either section were observed over time in repeated measures Wilcoxon signed ranks tests.

Discussion

Conversational Patterns: Structural Moves and Communicative Functions

This study demonstrates again the high level of conversational control adopted by parents of young children with cerebral palsy and the respondent role assumed by their children (Barrera & Vella, 1987; Basil, 1992; Hanzlik, 1990; Jolleff et al., 1992; Light et al., 1985a; Pennington & McConachie, 2001a; Sigafoos, 1999). As in previous research, interaction followed a repetitive pattern: mothers started most conversations, children responded and mothers acknowledged children's responses with follow-up moves. Mothers' frequent initiations often contained directives. Children used high levels of provisions of information, confirmations, denials, expressions of self, and physical responses and few requests.

Whilst it is acknowledged that the overall pattern of maternal conversational dominance remained after intervention, the change in the moves and pragmatic functions produced, with their large effect sizes, showed that It Takes Two to Talk was associated with mothers becoming more responsive and less directive, and with children initiating more and exerting more control in interaction. No changes were observed prior to parent training when children were receiving their usual therapy, suggesting that changes in interaction patterns were associated with the training parents received rather than children's maturation. The lack of change from the end of training to four month follow-up suggests that conversation patterns were maintained without intervention. Mothers and children did not revert to old

patterns of interaction. The patterns of change observed here are similar to those found in previous studies involving parents of children with developmental and language delay (Girolametto, 1988b; Hancock et al., 2002; Kaiser et al., 1996; Mahoney & Powell, 1988; Tannock et al., 1992; Yoder & Warren, 2001; 2002). As the children in our study had language delays our research supports previous findings. As the children had significant motor impairments our study also extends the evidence base, suggesting that early responsive interaction parent training might effective for a new clinical group.

We hypothesize that the reductions in maternal conversational control are a direct effect of training they received on a) recognizing their children's communication, b) directing conversation less and letting children lead. However, the relative effects of the two foci of intervention cannot be tested in the design of the present study. Furthermore, although the responses of mothers in this study were similar to those of parents of children with developmental and language delay in previous research, we do not know if this was due to similar knowledge sets being acquired. Parents whose children display idiosyncratic and difficult to interpret signals may have focused on different topics in the training to parents of children whose communication was following a delayed but readable pattern of development. Noteworthy, because of its potential lack of fit with reduced maternal control, is the decrease in mothers' use of real questions (requests for unknown information), which could engage children in conversation by soliciting new information and could extend conversation. However, when the transcripts were scrutinized it appeared that these questions were often produced when mothers were considering introducing new toys or activities. They would ask, for example, "Shall we play with teddy now?"; "Do you want to play with this one?" The reduction in these questions may be associated with mothers' letting children take the lead and following their children's focus of attention.

The change in children's communication observed here is of particular interest as the

goal of speech-language pathology is for children to become independent communicators. Increased use of initiations and requests (within the control function) will give children more power over their environment, allow them to gain information and become active participants in conversation and in social, educational and daily living activities. The use of these skills is a key aim for this clinical group, who are at risk of becoming observers rather than active participants (Pinder & Olswang, 1995; Schlosser & Sigafoos, 2002). We hypothesize that changes in children's communication were a secondary affect of training. Following the transactional theory (Sameroff & Fiese, 2000) it could be assumed that as parents created more opportunities for children to communicate and became more responsive to communicative attempts, children took these opportunities to initiate conversation and exert control by using more directives. However, this direction of effects cannot be confirmed in the present study and this hypothesis remains to be tested. Unexpectedly, we did not observe reductions in response moves or in the comply function as corollaries of children's increased initiations and control functions. It is possible that following parent training children increasingly engaged in interaction and produced responses where previously they might have ignored their mothers' communication or had insufficient time to communicate, but the statistical power of the present study was too low to show the full impact of changes to conversational structure which were investigated post hoc. The potential to increase engagement in interaction is important for this clinical group, as children with cerebral palsy frequently do not reply to others' communication (Light et al, 1985b; Basil, 1992; Pennington & McConachie, 1999), thereby increasing the already high risk of communication breakdown. Being fully involved conversations will increase children's experience, helping them to learn new interaction skills and reducing the possibility of 'learned helplessness' in relation to communication (Basil, 1992). Further investigation with a larger sample will show the full effects of training on parents-child interaction.

Maternal Language Input

Mothers in the present study did not reduce the frequency of turns, amount and complexity of their language input following training. This may be because the mothers in this study were already using simple language. Their MLU is consistent with the use of simple phrases and they produced on average one utterance per turn. It is also possible the training received during It Takes Two to Talk did not facilitate retention of new language behaviors. The motor disorders of children in our study severely limited their intelligibility; communication frequently broke down and was viewed as difficult by parents. Consequently, the emphasis of both the clinicians delivering the training and the parents participating was on communication rather than language (Pennington and Thomson, 2007). In parent training that has been associated with change in maternal language (Girolametto et al., 1996) language development and linguistic targets have been a central theme of the program. Additional intervention may be needed for parents of children with cerebral palsy to effect change in maternal language if seen as a particular problem.

Mothers' Views on Parenting

Mothers' scores on the PSOC were within the usual range (Johnston and Mash, 1989) and did not change following the intervention, suggesting that It Takes Two to Talk was not associated with changes in mothers' perceptions of their global skills as a parent or the value they place on this role. The lack of a reduction in scores, which would indicate harm, is encouraging. However, as a broad parenting scale the PSOC does not specifically examine parents' perceptions of their skills in communicating with their child or the value in which they hold their role as a facilitator of their child's communication development. Furthermore, the PSOC does not examine all areas of parental stress. It is possible that the time and organization needed to attend training places an additional burden on parents, leading to feelings of stress which may not be captured by PSOC. The impact of It Takes Two to Talk

on these more specific skills and potential stressors warrants further investigation.

Study Limitations

The current study was intended as an initial exploration of the possible effects of It Takes Two to Talk for families of young children with cerebral palsy, and results suggest that the program had positive outcomes for our sample. However, there are limitations in the current study's design which engender bias and prevent us from concluding that the treatment is generally effective for this new group of families. Firstly, this is a small study and sample size may have been insufficient to detect all changes that occurred in conversational patterns. All families and clinicians volunteered to take part and may represent highly motivated groups. Effect sizes may differ with a larger, more varied group of families and in training provided outside the research environment. Children's hearing was not tested for this study. Although there were no concerns from pediatricians or speech-language pathologists about children's hearing, and some had been screened, hearing impairments cannot definitely be ruled out for all participants. A further limitation is that the first coder was not blind to data collection point, which may be associated with an over estimation of effect size (Moher et al., 1998). However, the threat to performance bias may be reduced by the second rater coding approximately 20% of the data blind to the first rater's decisions and high agreement between the two raters' decisions was observed for high frequency behaviors. Lower agreement was noted for behaviors that occurred infrequently; these behaviors were excluded from analyses. It is possible that agreement would have been higher if the second rater had been familiar with the children in the study (Jolleff et al 1990). Familiarization of both raters, with viewings of all videotapes from a dyad prior to coding would be recommended for future research. Lastly, training was provided by different therapists, in different locations and not all parents attended all training sessions. We did not assess treatment integrity in this study. Thus, although the training was conducted according to the Hanen guidance (Pepper et al., 2004),

the training parents received would have differed slightly, which could account for within group variation.

Research Implications

This study showed that training was associated with mothers reducing their directiveness and children increasing conversational control. However, it is important to bear in mind that some degree of adaption of conversation will be necessary given children's slow communication rate, reduced access to vocabulary and difficulties in producing readable signals, (Marfo, 1990, Tannock and Girolametto, 1992). For example, parents of children with cerebral palsy may need to provide active help for children to choose activities, develop meaning and negotiate communication breakdown, which will involve parents' use of questions and commands. We should not therefore assume that maternal directives are inherently detrimental (Marfo, 1990). Additional analysis, possibly using conversational analysis techniques, could help gain further understanding of communication change (Clarke & Kirton, 2003; Clarke & Wilkinson, 2007), showing the extent to which parents are in tune with their children's physical needs, and whether further changes in conversational control patterns should be expected given the child's motoric limitations.

We have presented group, pooled results. The study does not examine possible patterns in communication for individual mother-child dyads, to investigate if some families changed more than others, if some mothers and children changed on some communication variables more than other variables, and if child and family characteristics had an effect on response to treatment. The delivery and contents of It Takes Two to Talk were not adapted for the study. It is possible that parents of children with severe motor disorders who may require AAC changed less than other parents and that additions to the program to cover AAC are needed. In addition, maternal education has been found to influence parents' responses to treatment by parents of children with delayed development and its effect should be

investigated for this group (Yoder and Warren, 2001). Correlation analysis of the current data set and further studies with larger samples is needed to explain patterns of response and to explore the effectiveness of the program for possible clinical subgroups.

The current study investigated mother-child interaction in one situation. Future research should test whether the effects of parent training programs have generalized effects on communication for parents and children. Coding interaction in multiple situations would also minimize the Hawthorne effect in which people change their behavior when they are aware they are taking part in an experiment (Jones 1992). The coding systems employed here could be used to describe interaction in different communication environments and activities or perceptual measures of communication activity, such as FOCUS (Thomas-Stonell, Rosenbaum, Oddson, & Robertson, 2007) could be employed.

This research suggests that It Takes Two to Talk was associated with a positive change in interaction for a group of mothers and their children with cerebral palsy. The general effectiveness of the training for this new group of families should be investigated in a randomized controlled trial in which families receive training in usual clinical conditions. The present study can be used to inform such a trial, suggesting suitable methods and procedures to be used and providing data necessary for sample size calculation to ensure that all clinically important effects will be observable. Such systematic building of evidence, in the hierarchical manner advocated by Robey and Schultz (1998) and UK Medical Research Council (MRC, 2000), will allow us to provide effective and acceptable treatment options to families of children with cerebral palsy through the early years and later childhood.

Acknowledgements

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Table 1

Inter-rater agreement moves and functions

	Move					Function										
	% (n)					% (n)										
	I	RI	R	F	NR	RJA	ROA	RI	RIK [a]	RClar	PI	Ack	PClar	CD	ES	B	Unint
Mothers	90.4	78.1	80.8	79.9		85.9	81.6	78.0	88.4	64.3	80.0	88.5	33.3	33.3	87.5	50.0	66.67
	(1064)	(142)	(134)	(254)		(114)	(359)	(520)	(295)	(28)	(205)	(295)	(3)	(3)	(32)	(14)	(3)
Children	83.3	51.4	92.4	82.9	83.4	70.6	47.6	62.3		25.0	74.1	75.6	50.0	77.6	86.4	91.0	53.9
	(294)	(35)	(669)	(41)	(380)	(114)	(21)	(153)		(12)	(255)	(41)	(14)	(58)	(140)	(279)	(13)

Note. I = initiation, RI = response-initiation, R = response, F = follow-up, NR = no response, RJA = request for joint attention, ROA = request for object or action, RI = request for information, RIK = request for known information, RClar = request for clarification, PI = provision of information, Ack = acknowledgement, PClar = provision of clarification, ES = expression of self, CD = confirmation or denial, Unint = unintelligible. [a] = Request for known information not coded for children

Table 2

Mothers' and children's moves expressed as percentages

Move	Mothers								Children							
	Time 1		Time 2		Time 3		Time 4		Time 1		Time 2		Time 3		Time 4	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Initiation	65.40	12.48	67.45	11.05	57.84	13.14	55.94	16.97	16.98	12.92	11.78	9.48	25.82	14.75	24.13	13.66
Response-initiation	9.09	7.61	8.94	5.53	9.28	7.35	14.94	9.28	1.61	2.76	4.37	4.88	3.81	4.24	2.05	2.36
Response	6.95	4.07	5.12	5.33	12.45	8.35	9.15	6.40	51.84	10.82	54.94	13.71	48.22	12.77	53.93	8.37
Follow-up	17.05	4.88	16.32	6.17	16.96	4.43	18.08	6.90	3.79	2.56	3.55	2.51	3.12	2.01	2.96	2.82
No response	1.55	2.61	1.80	3.15	3.47	4.25	1.83	2.14	25.52	9.34	26.43	12.13	19.03	16.82	16.90	10.14
Uncodable	.00	.00	.42	.81	.00	.00	.00	.00	.01	.02	.14	.45	.00	.00	.00	.00

Table 3

Comparison of move patterns between data collection points for mothers and children

Move pattern tested	Data compared	*t*	df	*p*	95% CI	*d*
Mothers						
Initiation	T1 – T2	.556	10	.591	-.107 – .178	.168
Initiation	T2 – T3	-2.730	10	.011*	-.300 – .030	-.823
Initiation	T3 – T3	-.460	9	.657	-.262 – .173	-.145
Response	T1 – T2	-1.763	10	.108	-1.081 – .126	-.532
Response	T2 – T3	3.891	10	.002**	-.387 – 1.423	1.173
Response	T3 – T4	-1.289	9	.230	-.443 – .121	-.408
Follow-up	T2 – T3	.622	10	.274	-.168 – .298	.188
Children						
Initiation	T1 – T2	-1.441	10	.180	-.951 – .204	-.434
Initiation	T2 – T3	3.150	10	.005**	.222 – 1.297	.950

Initiation	T3 – T4	.146	9	.887	-.374 – .425	.046
Response	T1 – T2	.516	10	.617	-.159 – .254	.155
Response	T2 – T3	-1.683	10	.062	-.301 – .402	-.507
Response	T3 – T4	2.167	9	.058	-.007 – .321	.685
Follow-up	T2 – T3	-.516	10	.309	-.487 – .304	-.155
No Response	T2 – T3	-2.530	10	.015	-.801 – -.051	-.764

Note. All data are log transformed using natural logs. T1 = Time 1, T2 = Time 2, T3 = Time 3,

T4 = Time 4. *predicted tests, $p <.05$, **predicted tests, $p <.01$. p values for the T2 – T3 comparison

are for one-sided tests, other tests are two sided.

Table 4

Mothers' and children's communicative functions expressed as percentages

	Mothers								Children							
	Time 1		Time 2		Time 3		Time 4		Time 1		Time 2		Time 3		Time 4	
Function	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
RJA	16.21	8.53	10.35	6.00	6.08	4.13	4.22	3.03	11.61	9.11	8.20	6.15	15.43	11.37	13.01	11.62
ROA	19.25	10.32	17.97	8.14	19.8	8.29	19.17	9.84	2.25	5.45	1.55	3.97	4.98	4.45	4.58	4.50
RI	15.21	11.32	20.08	9.47	18.64	7.23	22.17	6.20	2.56	2.85	4.74	5.92	5.43	6.46	5.70	5.86
RIK[a]	11.12	4.31	15.55	8.21	8.61	5.78	10.98	6.52								
PI	11.56	6.80	13.75	7.94	15.81	5.35	15.41	7.01	17.1	8.75	19.75	13.89	19.06	6.89	23.72	10.56
ACK	21.86	5.16	17.97	4. 9	24.82	6.13	23.29	9.41	8.13	10.92	5.96	6.13	6.23	5.46	3.03	3.14
PClar	.06	.18	1.57	.44	.14	.241	.14	.44	.96	1.95	1.97	4.12	.73	1.02	4.66	6.33
RClar	2.55	2.34	1.57	1.811	2.5	3.06	3.94	3.76	1.22	1.22	2.21	3.65	.96	2.57	0.28	.68
ES	1.37	1.71	.83	.98	1.01	1.41	1.1	2.36	.96	1.50	12.8	15.83	6.78	5.37	11.93	11.82
CD	.20	.45	.38	.59	.06	.21	.25	.55	7.78	4.51	10.23	6.42	15.60	12.25	14.47	8.02

| UNINT | .05 | .18 | .63 | 1.31 | .32 | 1.06 | .14 | .30 | 1.71 | 1.44 | .95 | 1.32 | 2.22 | 5.06 | 1.60 | 3.19 |
| BEHAVE | .44 | .62 | .25 | .61 | 2.21 | 4.27 | .44 | .89 | 35.55 | 18.85 | 31.81 | 14.51 | 22.64 | 12.19 | 19.08 | 12.31 |

Note. RJA = request for joint attention, ROA = request for object or action, RI = request for information, RIK = request for known information, PI = provision of information, ACK = acknowledgement, PClar = provision of clarification, RClar = request for clarification, ES = expression of self, CD = confirmation or denial, UNINT = unintelligible. [a] = Request for known information not coded for children

Table 5
Comparison of patterns in function use for mothers and children across data collection points

Pattern of functions tested	Data compared	t	df	p	95% CI	d
Mothers						
Directives	T1 – T2	1.133	10	.284	-.042 – .127	.342
Directives	T2 – T3	-2.630	10	.013*	-.351 – -.029	-.793
Directives	T3 – T4	.546	9	.598	-.107 – .176	.173
Children						
Control	T1 – T2	-.448	10	.664	-.657 – .437	-.135
Control	T2 – T3	2.987	10	.007**	.098 – .676	.901
Control	T3 – T4	.710	9	.496	-.171 – .328	.224
Comply	T1 – T2	-.895	10	.392	-.361 – .154	-.270
Comply	T2 – T3	-.767	10	.233	-.385 – .190	-.228
Comply	T3 – T4	-1.780	9	.109	-.388 – .046	-.563

Note. All data are log transformed. Directives = request for joint attention + request for objects or actions + request for known and unknown information; Control = request for joint attention + request for objects or actions + request for information + provision of information; Comply = confirmation or denial + acknowledgement + behavioral response. T1 = Time 1, T2 = Time 2, T3 = Time 3, T4 = Time 4. * $p = < .05$, ** $p = <.01$. p values for the T2 – T3 comparison are for one-sided tests, other tests are two-tailed.

Table 6

Maternal language characteristics

	Utt/min		Word/min		Utt/turn		MLU morphemes	
	Mdn	IQR	Mdn	IQR	Mdn	IQR	Mdn	IQR
Time 1	20.53	18.30−21.83	62.93	60.30−93.02	1.00	1.00−1.00	3.78	3.47−4.64
Time 2	18.73	16.30−20.90	69.32	57.36−82.20	1.00	1.00−1.00	4.19	3.83−4.48
Time 3	15.55	14.60−20.20	58.70	38.70−80.20	1.00	1.00−1.00	3.86	3.29−4.36
Time 4	18.45	15.80−23.20	67.12	43.58−85.43	1.00	1.00−1.00	3.97	3.24−4.51