

Verbal communication outcomes in children with autism after in-home father training

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Abstract

Background This retrospective study examined the efficacy of in-home father training on the communicative outcomes of children with autism. The in-home training consisted of two components: (1) expectant waiting; and (2) imitation with animation.

Methods Efficacy of parent training was examined by measuring the ratio of utterances produced by the parents to the utterances produced by the children and the number of verbal imitation by the parents. Outcomes of the children's verbal production were examined by measuring the number of (1) single word utterances; (2) different words produced; and (3) verbal response to questions.

Results Following training there was a decrease in the ratio of parent to child utterances and an increase in (1) the use of imitation by the parents; and (2) the number of single words and different words produced by the children.

Discussion Results of this study suggested that the parents had learned to wait for their children to communicate verbally during communicative interactions and to interact more efficiently with their children by using verbal imitation. Overall, the results of this

study support the efficacy of parent training that focuses on promotion of social reciprocity, and have important implications for clinicians and future research.

Keywords autism, communication, communication outcome, father training, social reciprocity intervention

Background and significance

Autism is becoming one of the most common developmental disorders (Alexander *et al.* 1996; Filipek *et al.* 1999). This disorder, thought by some to occur in approximately 1 in 500 to 1 in 2500 Americans, appears to be increasing in prevalence (Bryson & Smith 1998; Lord *et al.* 2000; Chakrabarti & Fombonne 2001; Fombonne 2003a). The prevalence of autism spectrum disorders including Asperger's syndrome is estimated to be approximately 1% of the general population (Arvidsson *et al.* 1997; Wing 1997). Children with autism exhibit deficits in social interaction and communication, as well as restricted and repetitive interests and behaviours (APA 1994). Most children diagnosed with autism also demonstrate delays in language development. In fact, children under three who are ultimately diagnosed with autism spectrum disorder are often brought to speech and language pathologists with speech language delays as the initial presenting problem. Although some of these children eventually develop verbal lan-

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guage, approximately 25–50% remain non-verbal (Bryson *et al.* 1988; Silbergeld 2005). Frequently, children with autism also exhibit behaviour problems stemming from their inability to communicate their wants and needs effectively. Parents of these children may also feel frustration and stress because they cannot communicate with their children (Hastings & Brown 2002).

Although autism is a disorder with lifelong consequences, intervention has been shown to improve communication outcomes. Durrand & Carr (1992) reported that children who were taught functional communication skills showed fewer challenging behaviours (e.g. aggression, opposition, tantrums, destruction). Goldstein (2002) also suggested that communication interventions to manage challenging behaviours had implications for broader outcomes (i.e. academic, vocational, and social). In the United States, many children with autism receive speech-language/communication intervention through early intervention programmes (before the age of 3), in public schools, or privately. However, the therapy is usually limited in frequency and duration. Thus, it has been suggested that any intervention (e.g. speech-language intervention, early developmental intervention) could be supplemented by in-home intervention to facilitate carry over of clinic-based programmes. Training the parents or family members to implement the intervention in the natural living environment (i.e. home) can be a tremendously efficient way of supplementing the clinic-based intervention (El-Ghoroury & Romanczyk 1999; McConnell 2002; Elder *et al.* 2005).

For children with autism, one focus of intervention has been on encouraging proper social behaviours and discouraging improper ones (see Goldstein 2002; and Rogers 2000; for a review). As mentioned above, involving family members, especially parents, can not only enhance any clinically based intervention programme but also provide another environment in which appropriately trained social behaviour taught at the clinic can be generalized at home. It can also give the parents a sense of involvement in their child's learning.

Different types of parent-centred training programmes have been developed to improve social-communicative skills of children with autism. Functional Communication Training (FCT; Moes & Frea 2002) involves parents' teaching children social com-

munication skills which should reinforce appropriate behaviour and eliminate inappropriate behaviour (e.g. asking for a toy instead of taking a toy without asking). Three families participated in Moes and Frea's intervention training study, which used a single-subject research design. All three children's communicative skills improved. These preliminary results are promising and suggest that the intervention should be replicated with more participants to determine external validity. Planned Activities Training (PAT; Huynen *et al.* 1996) structures everyday activities (e.g. bathtime, mealtime, getting ready for school) into a discrete set of instructions for the parent to talk about with the child as the child does each activity. The parent is also encouraged to listen to the child, wait attentively for the child to do the activity, and reward the child when the activity or parts of the activity are done correctly. As with FCT, positive reinforcement of correct social behaviour also serves to diminish problematic social behaviour. Four families were trained with this method and all four children showed improvement in their ability to engage in everyday activities, but as with the FCT study, it is unknown whether these findings could generalize in a larger sample.

Similar to PAT is the use of photographic activity schedules to shape social behaviour (Krantz *et al.* 1993). Instead of PAT's verbal instructions, this type of intervention uses photographs to show the child the steps involved in everyday activities, which is especially helpful for children with autism who have little or no verbal skills. All three children who were trained in this method showed improvement, but the possibility of generalizing these findings, as with the previous parent training programmes mentioned, is unknown.

Another problem that arises from reviewing parent training programmes is that, for the most part, mothers overwhelmingly are the parents who are trained, not the fathers (Rodrigue *et al.* 1992). Even in training programmes that involve both parents, usually it is left to the mothers to train the fathers (Moes & Frea 2002). Typically developing children who grow up in households in which the fathers are actively involved in their child's life are less likely to experience depression and finish their education than children who grow up in households where the father is not involved (Furstenberg & Harris 1993). Involved fathers of children with disabilities also report

increased feelings of parental competence and marital satisfaction than fathers who are not as involved (Willoughby & Glidden 1995). Having fathers involved not only increases their own feelings of self-worth as a parent but may also help their children have better life outcomes. The lack of father involvement in previous training studies also provides a gap in the social intervention training literature that needs to be addressed.

Russell & Matson (1998) are a notable exception to this. They trained three fathers to teach their developmentally disabled children everyday skills, such as riding a tricycle or brushing their teeth. The fathers were trained on three components: giving clear instructions, paying attention to appropriate behaviour and ignoring inappropriate behaviour, and giving their child appropriate consequences for their own behaviour (e.g. 'time-out' for temper tantrums). The fathers followed the training procedures faithfully over 90% of the time. While the children's behaviour was not the focus of this study, there were positive changes in their behaviour as well. Fathers also reported a high sense of satisfaction with the programme and a greater sense of parental self-efficacy as a result of taking part in this programme.

There are some limitations in this study, most notably the small sample size that does not allow for generalization across children with disabilities. Another problem is that the fathers are trained alone and are not encouraged to train their spouses. While this study provides evidence that fathers can train their children, it remains unknown whether fathers can be successful in training the family as a whole, which is the ultimate goal of parental intervention training.

Ozonoff & Cathcart (1998) suggested the effectiveness of home programme intervention on development of children with autism in a study that examined cognitive functioning change following home intervention. Rogers (2000) reviewed several studies that focused on social intervention and concluded that improvements in social interaction resulted in positive outcomes in language even though language was not directly targeted through the intervention (Rogers *et al.* 1986; Dawson & Galper 1990). While there are many interesting findings regarding in-home interventions with children with autism, it appears that data are particularly lacking on speech-language outcomes after parent-child

interaction training (Bibby *et al.* 2002; Drew *et al.* 2002). Therefore, our study focused on examining (1) the efficacy of the in-home father training intervention; and (2) the outcomes of children's verbal communication.

The efficacy of in-home father training and subsequent mother training was examined by (1) calculating the ratio of utterances produced by father (or mother) to utterances produced by children; and (2) counting the number of parent's verbal imitation. These measures were chosen because motivated by the likelihood that if the parents effectively learned expectant waiting, then they would be more likely to wait for their children's responses and produce fewer utterances relative to their children's utterances. Also if the parents effectively learned imitation with animation, they would have increased its use during the play interaction with their children.

Expanding on previous work (Elder *et al.* 2002) by using more language-specific measures, we examined outcomes of children's verbal production following father-training (i.e. father was trained by Elder and the father trained the mother) to promote social interaction (reciprocity). Language production by children in father-child and mother-child dyads during play at their homes was compared across time (baseline sessions, post-training sessions, maintenance sessions). Language production was measured because language is one of the primary means of sharing social reciprocity. We hypothesized that children's verbal communication would improve after parent training for social interaction. We also hypothesized that there would be differences in children's verbal communication when children with autism interacted with fathers who were the primary intervention agents vs. mothers.

The specific questions addressed in the study included: (1) Is in-home father training efficacious, and do fathers and mothers differ in their learning of social reciprocity? (2) Do children with autism demonstrate gains in verbal communication outcomes after their parents receive in-home training?

Methods

Research design and data source

This study is a retrospective analysis of data collected by the third author, Elder *et al.* (2002, 2003, 2005).

The primary purpose of the previous research was to evaluate the effects of an in-home training programme on the acquisition of training skills by fathers of children with autism and of pre-communication skills by the children themselves. Fathers were selected as primary intervention agents because current literature emphasizes the role of mothers in child training and little is known about fathers. Furthermore, fathers frequently assume secondary child-training roles, relinquishing primary training responsibility to the mothers. Yet, it is likely that fathers have the potential to positively influence the immediate and long-term welfare of their autistic children. Elder also observed from her previous study that fathers often reported that they did not know how to play with their children who typically failed to respond to the fathers' social initiations. Addressing these concerns, Elder modified for the fathers a previously tested mother training intervention designed to promote social reciprocity.

The training consisted of two components: (1) expectant waiting; and (2) imitating with animation (exaggerated affect). *Expectant waiting* was defined as 'the movement cycle that begins when the parent prompts a child's behaviour (e.g. 'Say ball.' 'Find block.')

and waits at least 3 s, providing the child with facial positions that signal the availability of positive social interactions. The cycle ends with the desired child response or a parental prompt if the response does not occur' (p. 278). *Imitating with animation* was defined as 'the movement cycle that begins within 5 s of a child's initiation wherein the

parent imitates the child's behaviour in an animated manner' (p. 278).

Father-child and mother-child dyads were videotaped in multiple baseline, intervention and maintenance sessions. Multiple baseline sessions ranged from four to eight, to ensure that data trends were stable prior to the beginning of the intervention. After baseline sessions, Elder taught Intervention I, *imitating with animation*, to the father in the absence of the mother. Fathers were then instructed to use this strategy while interacting with their children with autism. Play sessions lasted 15 min and were videotaped with additional teaching sessions as the fathers demonstrated difficulties using the skills taught. Then Elder taught Intervention II, *expectant waiting*, to the father. Again, a series of play sessions were recorded with additional teaching sessions provided. The additional sessions consisted of reviewing videotapes of fathers using the skills taught by Elder with their own children. Videotape review enabled fathers to see what they were doing well and what needed improvement. Figure 1 presents a summary of the training and videotaping sequence.

There were a total of three interventions, with one of the components trained in each of the first and second sessions (Intervention I, II as shown in Fig. 1) and both of the components trained together in the third session (Intervention I and II combined). Maintenance sessions were videotaped at 1, 3, and 6 months post intervention. The total number of videotaped sessions for each of the father-child dyads ranged from 14 to 22 over a 10–12-week period. All

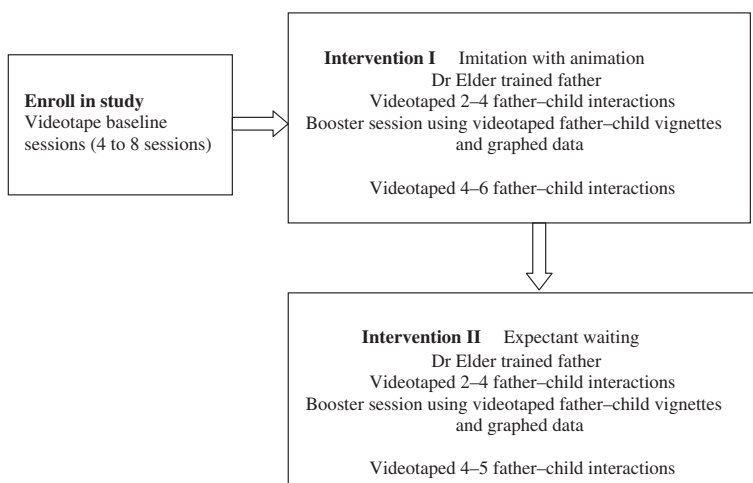


Figure 1 Schematic summary of in-home father training intervention.

Table 1 Characteristics of the children with autism

Family ID	Gender	Ethnicity	Mean age (years; months)	Speech therapy	Type of schooling
1	M	Caucasian	5; 7	Yes	Elementary special education
2	M	Caucasian	4; 11	Yes	Elementary special education
3	M	Hispanic	4; 8	No	Elementary special education
4	F	Caucasian	5; 4	Yes	Elementary special education
5	F	Asian Indian	7; 2	Yes	Regular kindergarten class
6	M	Caucasian	5; 1	No	Elementary special education
7	M	Caucasian	6; 1	Yes	Home-schooled
8	M	Caucasian	5; 0	Yes	Elementary special education

sessions were videotaped at each child's home while the child was playing with either the father or mother using a standard set of toys.

Participants

The inclusion criteria of the Elder *et al.*'s (2005) study were: (1) a diagnosis of autistic disorder based on Diagnostic Statistical Manual of Mental Disorders (DSM-IV) criteria (APA 1994); (2) above the cut-off scores of the Childhood Autism Rating Scales (CARS; Schopler *et al.* 1988) and Autism Diagnostic Interview-Revised (ADI-R; Lord *et al.* 1994); and (3) residence within 150 miles of the University of Florida. The exclusion criteria were an indication of physical/sensory impairment, or significant medical problems (e.g. seizure disorders, chronic otitis media) based on physical exam and/or medical history.

A sub-group of eight children who were enrolled in Elder's father training study ($n = 18$) was included in the current study. Eleven of the 18 families (61%) gave permission for examining their videotapes for this study. Three families who did not complete all the sessions were excluded. The ages of the eight children ranged between 4 and 7 years. The sample included six boys and two girls, which is consistent with the higher prevalence of autism in males than in females (Fombonne 2003b). Characteristics of the children are presented in Table 1.

The children had been referred to the original study by the Center for Autism and Related Disabilities, in Gainesville, Florida and a paediatric nurse practitioner in a community-based clinic.

Table 2 Scores of the four domains of Autism Diagnostic Interview-Revised (ADI-R; Lord *et al.* 1994) and Childhood Autism Rating Scales (CARS; Schopler *et al.* 1988)

Family ID	ADI-R				CARS
	1	2	3	4	
1	27	14	5	5	31
2	20	15	3	5	36
3	21	7	4	3	31
4	29	26	11	5	33
5	22	20	3	5	30
6	24	13	9	4	41
7	18	7	4	3	39
8	16	7	9	4	35

Domain 1: impairments in reciprocal social interactions (cut-off = 10); Domain 2: impairments in communication [cut-off (non-verbal) = 7]; Domain 3: repetitive behaviours and stereotyped patterns (cut-off = 3); Domain 4: abnormality of development evident at or before 36 months (cut-off = 1).

CARS scores range between 15 and 60, and higher scores indicate more severe symptoms. Scores of 30 and higher indicate presence of autism.

These children had been diagnosed with autism by psychologists and psychiatrists in the community according to DSM-IV criteria (APA 1994). To confirm the diagnosis of the participants, the third author administered the ADI-R (Lord *et al.* 1994). The ADI-R is a semi-structured caregiver interview format that has high clinical applicability and good psychometrics. Individual data of the four domain scores of the ADI-R are provided in Table 2. As

shown in Table 2, all participants met the cut-off scores for the diagnosis of autism in all four domains.

The CARS (Schopler *et al.* 1988) was also administered by Dr Elder. The CARS was administered to obtain severity information because the ADI-R provides categorical diagnosis but is not intended to provide the measure of severity (Tadevosyan-Leyfer *et al.* 2003). The CARS consist of 15 items in a 7-point Likert scale. Possible total scores range from 15 to 60. Children with scores greater than 30 are considered to have autism. CARS scores between 30 and 36.5 are considered to indicate mild to moderate severity level and scores between 37 and 60 are considered to indicate severe autism (Schopler *et al.* 1988). Six of the eight children who were included in this study fell in mild to moderate category based on CARS scores (see Table 2). Information on the families is presented in Table 3. As noted in the table, none of the siblings of the participants were diagnosed with autism. All fathers and mothers had more than a high school education (mean for father's education level was 16 years; mean for mother's education level was 15 years). All fathers held professional jobs, and five of the eight mothers (63%) worked outside the home.

Procedures

Parents were contacted by the third author for permission to examine the parent-child videotapes. Once the parents gave verbal permission over the telephone, two copies of the written consent/assent form with a self-addressed envelope were mailed to them. After receiving written consent/assent, the videotapes were transcribed orthographically using the language analysis software, Systematic Analysis of Language Transcripts (SALT version 7.0; Miller 2002). Because transcribing the tapes was labour intensive, we elected to systematically transcribe only the last tape within each time period (multiple baseline, intervention and maintenance sessions) on the assumption that it would be the most representative effect. The transcriptions were taken from 15-min samples of parent (either father or mother) and child interactions during in-home play sessions.

Language transcription

A graduate student in psychology, who was blind to the details of the study and had knowledge of language development and linguistics, transcribed the

Table 3 Characteristics of the families

ID	Father's age	Mother's age	Father's occupation	Mother's occupation	Father's education	Mother's education	Family information
1	41	33	University police	Homemaker	16 years	14 years	One older, normally developing brother
2	26	27	Lawn maintenance	Recording artist	14 years	15 years	One older brother, two younger sisters and one younger brother – all normally developing
3	41	41	Lift operator	Cashier	12 years	12 years	One older normally developing brother
4	47	47	Dentist	Dietician	20 years	16 years	Two older, normally developing brothers
5	45	37	Systems engineer	Homemaker	18 years	16 years	One younger normally developing sister
6	37	39	Psychologist	Registered nurse	16 years	14 years	One older, normally developing brother
7	30	29	Civil engineering	Civil engineer	16 years	17 years	One younger, normally developing brother
8	32	31	Service technician	Homemaker	12.5 years	13 years	Two younger, normally developing brothers

language productions from the tapes using a computer, a video player and a TV monitor. The graduate student wore headphones while transcribing samples.

Verbal utterances were transcribed orthographically into SALT, which allows for coding and analysis of verbal and non-verbal utterances. Utterances had to end with utterance boundary punctuation to be recognized as an utterance. Utterance boundaries were segmented according to intonation contour and/or pauses longer than 2 s. If the transcriber could not understand an utterance after three attempts, it was transcribed as unintelligible (x).

Reliability

The reliability of the language transcription was evaluated by having two trained raters transcribe 15% of the sample. These videotapes were randomly selected and transcribed by transcribers who were blind to the specifics of the study. Upon completion of the reliability transcriptions, transcriptions were reviewed for disagreement by the first author. Most disagreements were in defining utterance boundaries. When there was disagreement, the transcription of the primary transcriber was given credit based on her knowledge and experience in language transcription. The two sets of transcription showed a reliability agreement rate of 93%.

Data analysis

Data were analyzed using SPSS-X (11th edition). Analysis of Variance (ANOVA) was used on the basis of the following rationales: (1) results of Levene's tests of equality of variance indicated that variance of the variables between groups (play partner; father vs. mother) was homogeneous; (2) even when assumptions were violated, the ANOVAs were fairly robust; and (3) the magnitude of the observed power (ranged from 0.70 to 0.97) was sufficiently strong to detect the effect size.

The efficacy of parent training was examined by (1) calculating ratio of the number of parents' utterances to the number of children's utterances; and (2) counting the number of parents' verbal imitation. The outcomes of children's verbal communication were examined by counting (1) the number of single word utterances produced; (2) the number of different words produced; and (3) the frequencies of

child's verbal responses to their parent's questions. The measure of single word utterances was selected rather than the total number of utterances as it was thought to be appropriate to the limited language level of the participants. Also the number of different words was selected instead of total number of words produced because of frequent perseveration (word repetition) often observed in this population. The efficacy of parent training and outcomes of children's verbal communication were compared within the study group instead of comparing with a control group. The efficacy of the training components was evaluated using intra-subject methodology that is commonly employed when evaluating new behavioural interventions. This method provides opportunities to closely evaluate individual responses as each subject is compared with his/her own baseline. Because this was a retrospective study and an exploratory examination of the efficacy of the parent training, comparing the measures following the intervention to those of the baseline (prior to the implementation of the intervention) was selected as a method.

Results

Data were analyzed to address the following research questions: (1) Is in-home father training on social reciprocity efficacious, and do fathers and mothers differ in their learning of social reciprocity? (2) Do children with autism demonstrate gains in verbal communication outcomes after their parents receive in-home training?

Efficacy of in-home parent training

The efficacy of parent training was examined using ANOVAs on (1) the ratio of total utterances produced by parents and children during their play (henceforth referred to as ratio); and (2) the number of verbal imitation by parents (henceforth referred to as imitation). Three intervention phases (baseline, intervention, maintenance) were within-subject variables and play partner (father or mother) was the between-subject variable. The ratio proved to be significant, $F(2, 28) = 8.4$, $P = 0.001$, $\eta^2 = 0.37$, observed power = 0.94. However, the ratio-play partner interaction effect or play partner main effect was not

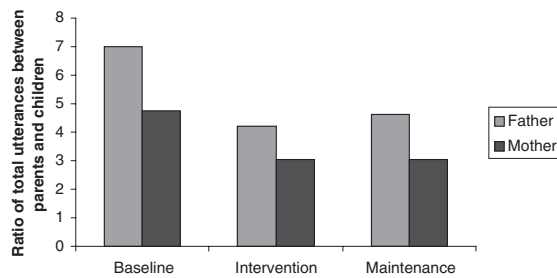


Figure 2 Ratio of total utterances produced by parents and children.

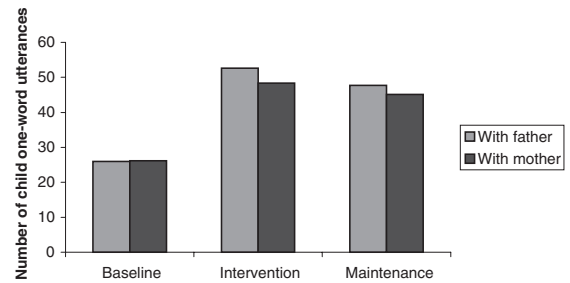


Figure 4 Number of one-word utterances produced by children.

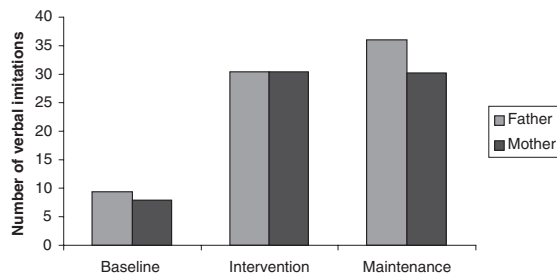


Figure 3 Number of verbal imitations produced by parents.

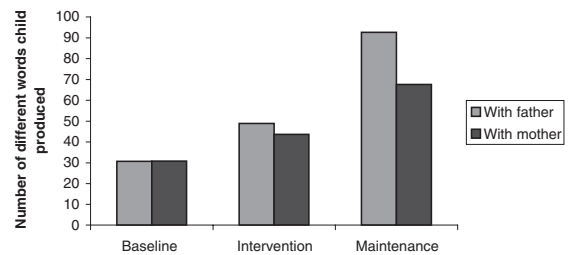


Figure 5 Number of different words produced by children.

significant indicating that there was no difference between fathers and mothers in learning skills designed to promote social reciprocity. The ratio decreased after intervention compared with the baseline, $t(15) = 3.4$, $P = 0.004$, as shown in Fig. 2. Imitation by parents was significant over time, $F(2, 28) = 5.94$, $P = 0.007$, $\eta^2 = 0.30$, observed power = 0.84. The number of imitations increased after intervention, $t(15) = -4.3$, $P = 0.001$, compared with the baseline as shown in Fig. 3.

Outcomes of children's verbal communication

Verbal production that consisted of single word utterances was statistically significant for intervention phase main effect, $F(2, 28) = 4.3$, $P < 0.05$, $\eta^2 = 0.24$, observed power = 0.70, as shown in Fig. 4. The number of single word utterances increased after intervention, $t(15) = 2.94$, $P = 0.005$, compared with the baseline. However, neither partner nor session-partner interaction effect was statistically significant.

Intervention phase main effect was statistically significant on the number of different words produced, $F(2, 28) = 9.0$, $P = 0.001$, $\eta^2 = 0.39$, observed

power = 0.96. Neither partner nor session-partner interaction effect was statistically significant as shown in Fig. 5. Children produced more variety of words in the intervention than in the baseline phase, $t(15) = 2.63$, $P = 0.0095$, and in the maintenance rather than in intervention phases, $t(15) = 2.49$, $P = 0.0125$. However the various word productions by children did not differ either with their fathers or mothers. Individual data in Fig. 5 show that participants 6, 7, 8 had noticeable increases in producing various words during maintenance phase compared with the intervention phase. The variability was also larger with the fathers than with the mothers.

Response to questions showed insignificant change over the intervention period, compared with baseline. Children's response to parent's questions increased in the intervention phase compared with the baseline. However, it did not result in statistical significance secondary to the larger variability.

Discussion

The results of this study indicate that: (1) parent training designed to promote expectant waiting and

imitation with animation was efficacious as measured by the ratio of parent to child utterances produced during play as well as the number of verbal imitations of the parents; fathers and mothers did not show differences in their learning of the trained skills training; (2) communication outcomes of children with autism showed increases in one-word utterances produced and the number of different words produced. However, the children's verbal communication outcomes were not statistically different.

Efficacy of the expectant waiting and imitation with animation training

It has been clinically observed and reported in the literature that parents of children with autism tend to talk constantly instead of giving the child time to respond (Siller & Sigman 2002; Spiker 2002). This observation provided the motivation for Elder's father intervention study that evaluated a training component designed to teach fathers how to be less directive and wait expectantly for child's responses. Parents' verbal social reciprocity was measured using the ratio of parents to child utterances produced during their play and the verbal imitation. The results of this study suggest that parents reduced their average number of utterances produced and children increased the utterances produced following parent training on social reciprocity. We speculate that this change is the result of the parents' training in expectant waiting; however, because parents also received training in imitation with animation, it is not possible to attribute this change exclusively to training on expectant waiting at the current time. Further investigation on this issue is warranted, however. Parents also demonstrated that they learned imitation with animation as measured by the number of verbal imitations they produced, following the intervention while engaged in play with their child. These results support the effect of these specific parent training components on changes in parents' verbal communication. The negative result of the play partner effect suggests that fathers can be trained on social interaction with their children with autism. Once they are trained on their interaction that promotes the social reciprocity, they interact as well as the mother would with the children.

Verbal communication outcomes of children with autism

Children in this study demonstrated positive gains in their verbal communication outcomes in the following areas: (1) increased production of single word utterances; and (2) increased production of various words (i.e. number of different words) produced. Children produced more variety of vocabulary and more utterances that consisted of single word utterances. Their responses to questions did not result in statistical significance. We did not find significant differences between father-child and mother-child dyads on the dependent measures.

These non-significant findings may be explained by the large variability of the data. It appeared that responses to the fathers' questions were more variable than to the mothers' questions. Even though the children's mean turn length did not change, the children interacted more frequently in apparent response to questions, possibly using a single word as response or imitating the adult's utterances. Also the decrease in the ratio of adult's to child's utterances may be a result of the efficacy of expectant waiting as well as more response from the children (Siller & Sigman 2002; Spiker 2002).

Approximately more than half of the child utterances were one-word utterances. Most of the one-word utterances consisted of nouns (e.g. shapes, animals and animal sounds, colours, numbers, toys, common objects, body parts), pronouns (e.g. I, you), locatives (e.g. up, down, here), and a few verbs (e.g. look, love). When imitated utterances were examined, most were one-word productions and a few two- to three-word phrases with the exception of one child (id # 5) who was more verbal than the other children in the study. This was the oldest participant who also attended in the regular classroom. Examples of this child's imitation include 'Can you see papa through there?' 'Are you all done with the camera?' 'How do you smell the soup?' 'If you pull it down, we can listen to the car. A close reading of the children's transcripts showed that the utterances of the two children (id # 4, 5) who produced more than single word utterances were flexibly communicative. They produced sentences that were appropriate in the context. It should be noted that six out of eight children received speech-language intervention at the time they were enrolled in the study. Obviously these two might have

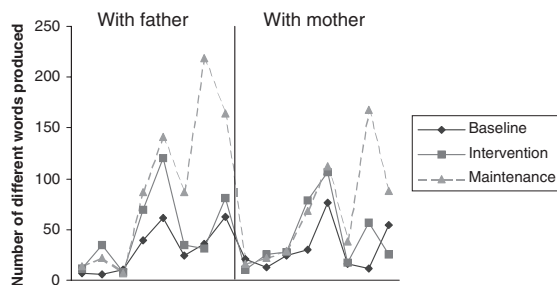


Figure 6 Individual data plots of different words produced by children.

made the most progress because of the influence of the speech-language intervention.

Following training on social reciprocity with their children with autism, parents made positive changes in giving the child time to respond and in not dominating the child by talking constantly. This positive change appears to have brought about changes in the child's verbal communication outcomes. Following intervention to the parents, the children in this study produced more words while they were playing with their parents. Overall, positive changes occurred between baseline and intervention phases but the positive change did not continue to grow with the exception of the production of different words, as shown in Fig. 5. Individual data plots of the number of different words produced by the children with mothers and with fathers (see Fig. 6) showed that (1) almost every child continued to produce more words in the maintenance phase with fathers as opposed to mothers; and (2) there was more variability in the number of different words produced with fathers than with mothers. For the other measures, however, any positive changes either decreased or remained more or less the same from intervention to maintenance phases.

Clinical implications and future directions

Even though the children were not the direct targets of the communication intervention, they produced more words following in-home parent training on social reciprocity. This has clinical implications and lends strong support for this kind of intervention for children with autism. Typically these children receive direct communication intervention from a speech and language pathologist two to five times

per week, between 30 min to an hour per visit, in a clinic or classroom setting. Regardless of its intensity, this may not be a sufficient amount of intervention. The results of this study support parent training as a supplementary intervention method for the children with autism. These results are also consistent with those of Koegel *et al.* (1996) who found a collateral intervention effect obtained by parent training.

The results of less significant positive change between intervention and maintenance sessions compared with the baseline and intervention sessions suggest the need for additional sessions (booster sessions) following training. These could include reviewing videotaped parent-child interactions in person or via computer correspondences to illustrate and clarify important points. Also important would be replications of the protocol with additional subjects to further examine individual training component effects and assess external validity.

Limitations

As noted in Table 1, the majority of the children (six out of eight) received speech therapy as well as schooling during this study. When speech therapy and/or schooling occurred concurrently it is possible that these interventions also contributed to the positive child outcomes. Ideally, the amount, type and intensity of speech-language therapy should be controlled to determine the true effects of social reciprocity training for parents on children's verbal communication outcome. However, this type of rigorous control is difficult to achieve in naturalistic settings.

Not having an attention only control group is a limitation of this study. Because this was a retrospective study, having a control group was not possible. However, there were within-subject controls (baseline prior to the implementation of the intervention) to compare the effect of in-home father training. Furthermore, it is very unlikely that these children developed verbal communication spontaneously within 3-week intervention period. Also, this study was an exploratory examination for a more rigorously designed study in the future. Admittedly, generalization of our findings is limited by the small number of participants ($n = 8$) and possible sampling bias. That is, the families who allowed us to conduct a retro-

spective study may be more invested in the process and thus, more proficient than families who did not respond to our requests to conduct the secondary analysis. Nevertheless, our significant findings and methodological discoveries have important implications for clinicians and future research. Family stress and marital satisfaction may also have played a role in the efficacy of the father training. This will be added in the future studies.

Clearly, the needs of these children and families are complex and because language development is so critical to the overall child development and prognosis, attention should remain focused on developing and rigorously testing methods to assist these families in facilitating language development in this fascinating and challenging group of children.

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