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Brief parent training in pivotal response treatment for preschoolers with autism

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Background: Evidence of improved outcomes with early behavioural intervention has placed the early treatment of autism as a health priority. However, long waiting lists for treatment often preclude timely access, raising the question of whether parents could be trained in the interim. Parent training in pivotal response treatment (PRT) has been shown to enhance the communication skills of children with autism. This is typically provided within a 25-hour programme, although less intensive parent training may also be effective. The main objective of the present study was to evaluate the efficacy of brief training in PRT for parents of preschoolers with autism, who were awaiting, or unable to access, more comprehensive treatment. **Method:** Eight preschoolers with autism and their parents participated in the study. A non-concurrent multiple (across-participants) baseline design was used, in which parents were seen individually for three 2-hour training sessions on PRT. Child and parent outcomes were assessed before, immediately after, and 2 to 4 months following training using standardised tests, questionnaires and behaviour coded directly from video recordings. **Results:** Overall, children's communication skills, namely functional utterances, increased following training. Parents' fidelity in implementing PRT techniques also improved after training, and generally these changes were maintained at follow-up. A moderate to strong relationship was found between parents' increased ability to implement PRT techniques and improvement in the children's communication skills. **Conclusion:** Our findings suggest that brief parent training in PRT promises to provide an immediate, cost-effective intervention that could be adopted widely. **Keywords:** Autism, pivotal response treatment, parent training, communication.

Evidence has demonstrated that outcomes for children with autism spectrum disorder (hereafter referred to as autism) are substantially improved with early intensive behavioural intervention (EIBI; e.g., National Autism Center, 2009; National Research Council, 2001; Rogers & Vismara, 2008). However, currently for many children access to EIBI is either precluded or delayed beyond the recommended age (e.g., Majnemer, Shevell, Rosenbaum, & Abrahamowicz, 2002) due to long waiting lists. Training parents in evidence-based intervention techniques is generally considered an efficient method of expanding the availability of intervention services to children with autism. Additional advantages of parent training are the potential for increased maintenance and generalisation of child skills, and increased parental self-efficacy (e.g., Bryson et al., 2007).

There is some evidence for the effectiveness of training programmes for parents of children with autism (e.g., Aldred, Green, & Adams, 2004; Drew et al., 2002; McConachie, Randle, Hammal, & Le Couteur, 2005), although the results of a recent RCT show minimal effects on symptoms of autism and moderate effects on child communication (Green et al., 2010). These programmes vary in orientation, although most focus on enhancing the children's ability to communicate. Currently, parent training programmes for children with autism are relatively intensive (25 to 180 hours of training), which is problematic when confronted with long waiting lists for service. It is therefore critical to determine whether briefer parent training has a positive impact on child and parent outcomes. To date, only three studies have addressed this question (Baker-Ericzen, Stahmer, & Burns, 2007; Stahmer & Gist, 2001; Vismara, Colombi, & Rogers, 2009).

One non-random assignment group design study ($N = 22$) demonstrated that some parents are able to learn the techniques of pivotal response treatment (PRT) after 12 weekly one-hour individual sessions (Stahmer & Gist, 2001). PRT focuses on increasing the child's motivation to communicate, using the principles of applied behaviour analysis in play and other natural daily-life settings (R.L. Koegel et al., 1989; R.L. Koegel & L.K. Koegel, 2006). Parents who participated in both the parent training sessions and a parent support group ($n = 11$) were more likely to master the strategies than parents who completed the training sessions alone (8/11 versus 4/11 parents met the fidelity criterion, respectively). Parents who mastered the PRT techniques reported significantly larger increases in their children's vocabularies. Also, the number of words children used (coded from video) increased from pre- to post-intervention, regardless of parental skill level. While these results are promising, no follow-up data were collected and child outcomes were based largely on parent-report measures.

Additional support for 12 weekly, one-hour individual parent training sessions in PRT comes from a large-scale ($N = 158$) community-based study in

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which significant improvements were found in parent-reported adaptive skills immediately following training (Baker-Ericzen et al., 2007). Unfortunately, the researchers did not evaluate other child outcomes or parents' fidelity of implementation, and there was no follow-up evaluation.

More recently, Vismara and colleagues (2009) used a multiple baseline design ($N = 8$) to evaluate 12 one-hour weekly sessions of parent training in the Early Start Denver Model. This model of intervention incorporates PRT and other techniques from the Denver Model, which focuses on teaching imitation, non-verbal communication and pragmatics. Parent fidelity increased with training, with most parents (87.5%) meeting the fidelity criterion after 6 hours of training. In addition, children's spontaneous functional utterances, imitation skills, and engagement improved following 12 hours of training and were maintained at the 3-month follow-up. Furthermore, the largest gains in children's spontaneous functional utterances occurred once parents demonstrated the ability to implement the strategies with fidelity. This study's results raise the question of whether parents are able to acquire the intervention skills with 6 hours of training and have a positive impact on their children's outcomes.

The present study was designed to examine the efficacy of brief (6-hour) training in PRT for parents of young children with autism. Eight families of preschoolers with autism, who were waiting to access a more intensive intervention programme, participated in 6 hours of training in PRT. The main question was whether child gains would occur in multiple domains of behaviour, notably in communication and disruptive behaviour, post-training and at follow-up. Secondarily, the study examined whether brief training in PRT would be sufficient for parents to learn how to implement the strategies with fidelity, and whether parent training would be associated with improvements in their perceived self-efficacy. Finally, we examined whether gains in parent fidelity were associated with gains in child communication.

Method

Participants

Participants were eight families of children newly diagnosed with autism, recruited through an eligibility list for a publicly funded EIBI Programme. One parent of each child participated in the study (5 mothers and 3 fathers). Inclusion criteria were that families had a child aged 2–5 years diagnosed with autism, lived within 30 km of the IWK Health Centre, and that parents had a minimum Grade 8 education. Families were excluded from the study if the child was already receiving some form of applied behavioural analysis treatment; and if the child had a major sensory, motor or neurological impairment/disorder (e.g., uncorrected visual or hearing loss, or physically incapacitating brain damage). Only one family was excluded, specifically because they lived too far from the study site.

All children were diagnosed with autism by an independent developmental pediatrician and psychologist with expertise in autism using DSM-IV-TR (APA, 2000). Seven of the eight children met criteria for autism on the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 1999) and the Autism Diagnostic Interview – Revised (ADI-R; Lord et al., 1994). Child 2's ADI-R scores fell below the cut-off (4 and 3 points below the cut-off for reciprocal social interaction and communication, respectively); however, his ADOS scores were above the autism cut-off, and he was given a clinical diagnosis of autism. Table 1 summarises the children's characteristics at baseline. Prior to training, children's word use ranged from one-word approximations (e.g., 'mmm' for 'more') to short phrases. All families spoke English as their primary language and were of middle to upper-middle socioeconomic status (Hollingshead Index; Miller, 1983). Parent education ranged from partial high school to graduate degree. All but two families (Child 1 and 2) had completed the Hanen 'More than Words' programme (Sussman, 1999) within 1 to 2 months prior to beginning the study. This is a training programme designed to help parents promote communication and social skills in their children, consisting of eight 2.5-hour group sessions and three home visits. The programme is publicly funded in this province, and was facilitated by two speech-language pathologists.

Table 1 Child characteristics at baseline

Child	Age (yrs; mo)	Sex	Cognitive ability (percentile, test)	PLS AC[a] Age-equivalent	PLS EC[b] Age-equivalent
1	4;8	M	1st, DAS[c]	3;10	2;11
2	3;3	M	2nd, WPSSI-III[d]	2;7	2;9
3	3;8	M	<1st, Bayley-III[e]	1;3	1;5
4	3;9	M	9th, Bayley-III	2;7	2;3
5	4;3	M	16th, Bayley-III	2;5	1;10
6	2;4	F	<1st, Bayley-III	0;7	1;3
7	4;4	M	<1st, Bayley-III	1;6	2;0
8	4;1	M	<1st, Bayley-III	2;1	1;11

[a]Preschool Language Scale 4th Edition (Zimmerman et al., 2002), Auditory Comprehension; [b]Preschool Language Scale 4th Edition, Expressive Communication; [c]Differential Ability Scales (Elliot, 1990); [d]Weschler Preschool and Primary Scale of Intelligence, 3rd Edition (Wechsler, 2002); [e]Bayley Scales of Infant and Toddler Development 3rd Edition (Bayley-III; Bayley, 2005).

Study design

A non-concurrent multiple (across-participants) baseline design was used. Participants remained in the baseline (pre-training) phase for 3 to 7 weeks. The effects of the intervention were evaluated at both the end of the 2-week training period (post-training) and 2 to 4 months following training (follow-up).

Parent education procedures, settings and materials

Parent training sessions. Parents received three separate 2-hour training sessions over 2 consecutive weeks, for a total of 6 hours of individual training in PRT techniques. Prior to the first session, parents were provided with 'How to teach pivotal behaviours to children with autism: A training manual' (R.L. Koegel et al., 1989). The first two parent training sessions were conducted at our clinical lab and the third session was conducted in family homes in order to promote generalisation of parents' PRT skills. During the first session, parents were introduced to basic PRT principles, and the trainer modelled the techniques with the child. For the remainder of the session, parents implemented PRT techniques with their child, while receiving feedback from the trainer. PRT was taught in the context of play with the child. The second and third sessions consisted mainly of in vivo feedback for the parents, as well as problem solving on issues that had arisen since the previous session.

Cameras. Two Sony Handycam DVD camcorders with surround sound microphones were used to collect the video probes.

Child outcome measures

Communication. Two methods, functional verbal utterances and type of utterance, were used to measure changes in child communication. Following R.L. Koegel, Symon, and L.K. Koegel (2002), the presence or absence of functional verbal utterances (FVUs; for details, see Supplementary Appendix A) was coded from each 15-second interval of a 10-minute video recording, and the percentage of intervals with FVUs served as the dependent variable.

As the second communicative outcome measure, 5-minute video segments were coded for whether child utterances were appropriate (i.e., functional and directed) or inappropriate (e.g., stereotypic, echolalic or incomprehensible) and the degree to which they were prompted (i.e., model prompted, indirectly prompted, or child initiated) using an incidence scoring form (see Supplementary Appendix B for definitions). Overall responsivity was calculated as the percentage of times the child responded appropriately, following either a model prompt or an indirect prompt.

Language. Two standardised measures were used to determine whether expressive and receptive language improved at follow-up. The Preschool Language Scale, 4th Edition (PLS-4; Zimmerman, Steiner, & Pond, 2002) and the Peabody Picture Vocabulary Test, 3rd Edition (PPVT-III; Dunn & Dunn, 1997) are individually administered tests of language.

Disruptive behaviour. Disruptive behaviour was assessed by coding its occurrence or non-occurrence during each 15-second interval of a 10-minute video segment. Disruptive behaviour was operationally defined as (a) vocal (e.g., screaming, whining or crying); (b) physical (e.g., hitting, kicking, throwing, pushing); or (c) oral (e.g., biting, spitting).

Parent outcome measures

Fidelity of PRT implementation. A continuous 1-minute interval coding system was used (ten 1-minute intervals) to code fidelity of PRT implementation. Each interval was coded as either correct or incorrect for each of the following 5 techniques: Clear Opportunities, Child Choice, Contingent, Natural Rewards, and Rewards Attempts (for definitions, adapted from R.L. Koegel et al., 2002, see Supplementary Appendix C). The fidelity of implementation score was the average percentage of intervals, across all five strategies, during which parents demonstrated appropriate use of the techniques. Following Stahmer and Gist (2001), the criterion for fidelity of implementation was 75%.

Self-efficacy. Parental self-efficacy was measured using the Parental Self-Efficacy Scale, which is a domain-specific measure of parents' perceived self-efficacy related to their child's challenging behaviour (Hastings & Brown, 2002). This parent-report questionnaire consists of five items, each rated on a 7-point scale; the total score was used.

Satisfaction. Parents completed a questionnaire assessing their satisfaction with the training, created for the purpose of the current study.

Data collection procedures

Fifteen-minute video-recorded probes were collected during pre-training, post-training and at follow-up. In each phase, a research assistant video-recorded the parent interacting with his/her child during typical play with toys at the family's home. Four to five video probes were collected on separate days during the pre-training phase (ranged from 3 to 7 weeks), and 3–5 probes were collected on separate days during each of the post-training and follow-up phases. The first 10 minutes of each probe were coded for the outcome measures, and data were averaged across the video probes in each phase.

Parents completed the parental self-efficacy questionnaire at all three time points (pre- and post-training and at follow-up) and the Parent Satisfaction Questionnaire after completing the training. Before training and at follow-up, the children completed a standardised language assessment (PPVT-III and/or PLS-4).

Inter-observer reliability

The primary coder for each outcome measure was blind to treatment phase. In order to establish inter-observer agreement on each of the measures coded from video recordings, an independent coder coded 30% of the videos, including an equal number of randomly selected

pre-training, post-training, and follow-up videos from different children. For videos coded for the occurrence versus non-occurrence of behaviours, inter-observer reliability was calculated using both inter-observer agreement per interval and kappa coefficients (Cohen, 1960). Intra-class correlations were calculated for interval/ratio measures.

Overall, inter-observer reliability was good for all measures coded from videos. The mean inter-observer agreement was 86%, with kappa of .85 for FVUs; 97%, with kappa of .97 for disruptive behaviour; and 80%, with kappa of .79 for fidelity of implementation. With regard to utterance type, intra-class correlations were excellent (model prompted: .79; indirectly prompted: .96; initiations: .91; inappropriate responses: .88; no response: .98).

Analyses

Both visual inspection and statistical analyses were used to evaluate the data. For child FVUs and parent fidelity of implementation, individual data were displayed graphically and inspected for changes in level upon introduction of the training (as recommended by Kazdin, 1982). The Wilcoxon matched-pairs signed-ranks test (Sheskin, 2007; Wilcoxon, 1945) was used to determine whether, overall, a statistically significant change occurred after training (i.e., pre-training to post-training), and whether gains were maintained at follow-up (i.e., post-training to follow-up). In order to determine the magnitude of the changes, effect sizes were also calculated (Cohen, 1992). Spearman's correlations were used to assess the relationship between changes in parent fidelity and changes in child communication (i.e., FVUs and responsivity) from pre-training to post-training and follow-up.

Results

Child outcomes

Functional verbal utterances. Figure 1 provides data on the percentage of intervals with FVUs during parent–child interactions. As shown there, all eight children demonstrated an increase in FVUs after training, although gains were minimal for Child 1 and Child 6 (mean increase of 9.0% and 4.5%, respectively). Between post-training and follow-up, Children 1, 5, and 6 made gains in FVUs (mean increase of 8.3%, 11.2%, and 25.7%, respectively). Three children (3, 4, and 7) demonstrated a slight decrease in FVUs between post-training and follow-up (mean decrease of 4.5%, 5.7%, and 9.0%, respectively), while Children 2 and 8 displayed a larger decrease in FVUs from post-training to follow-up (mean decrease of 29.4% and 20.0%, respectively). No general patterns, based on initial language level, were observed across the three treatment phases.

Overall, the children's FVUs increased following training (Wilcoxon (Z) = −2.52, $p < .05$, $d = 1.00$; mean change = 25.84%, range = 4.5–58%). Moreover, the group gains in FVUs observed post-training were maintained at follow-up ($Z = -.92$, $p > .05$, $d = .14$).

Nature of child utterances. The percentage of times the children responded appropriately (Responsivity) increased significantly following training ($Z = -2.52$, $p > .05$, $d = .85$; see Table 2), and was maintained at follow-up ($Z = -.56$, $p > .05$, $d = .25$). The percentage of responses that were preceded by a model prompt did not differ from pre- to post-training, or from post-training to follow-up ($Z = -1.12$, $d = -.42$ and $Z = -.14$, $d = .14$, $p > .05$, respectively). However, there was a significant increase in the percentage of responses that were indirectly prompted ($Z = -2.24$, $p < .05$, $d = .91$), which was maintained at follow-up ($Z = -.14$, $p > .05$, $d = -.18$). The percentage of initiations did not change significantly following training ($Z = .0$, $p > .05$, $d = .04$) or from post-training to follow-up ($Z = -.28$, $p > .05$, $d = -.11$). Similarly, the percentages of inappropriate responses did not change across the three phases ($Z = -.56$, $d = .11$ and $Z = -.84$, $d = .30$, $p > .05$, for pre- to post-training and post-training to follow-up, respectively). There was a significant decrease in the percentage of no responses following training ($Z = -2.24$, $p < .05$, $d = .73$), which was maintained at follow-up ($Z = -.14$, $p > .05$, $d = .16$).

Standardised language measures. Overall, there was no significant difference in age-equivalent scores between pre-training and follow-up (4 to 6 months) on the Auditory Comprehension (AC) scale of the PLS-4 ($Z = -.34$, $p > .05$, $d = .05$, $n = 8$). However, there was a trend towards higher age-equivalent scores at follow-up compared to pre-training on the Expressive Communication (EC) scale of the PLS-4 ($Z = -1.83$, $p = .07$, $d = .34$, $n = 8$). In two children, large age equivalence gains were made on the PLS-4: 13 and 12 months (Child 2), and 3 and 7 months (Child 6), for AC and EC respectively.

Overall, there was no significant difference in age-equivalent scores between pre-training and follow-up on the PPVT-III ($Z = -1.60$, $p = .11$, $d = 1.16$, $n = 5$). Individual PPVT-III scores indicated that single-word receptive vocabulary increased at a rate greater than expected following training for 3 of the 5 children who were able to complete the test: over the 4- to 6-month period of the study, age equivalence increased by 7 months (Child 1), 23 months (Child 2), and 12 months (Child 4).

Disruptive behaviour. With two exceptions (Children 1 and 6), there was minimal disruptive behaviour during the video-recording sessions (i.e., average of less than 10% of intervals), regardless of treatment phase. Child 1 displayed disruptive behaviour during the pre-training phase, which decreased immediately following training (mean decrease of 10%) and was maintained at the

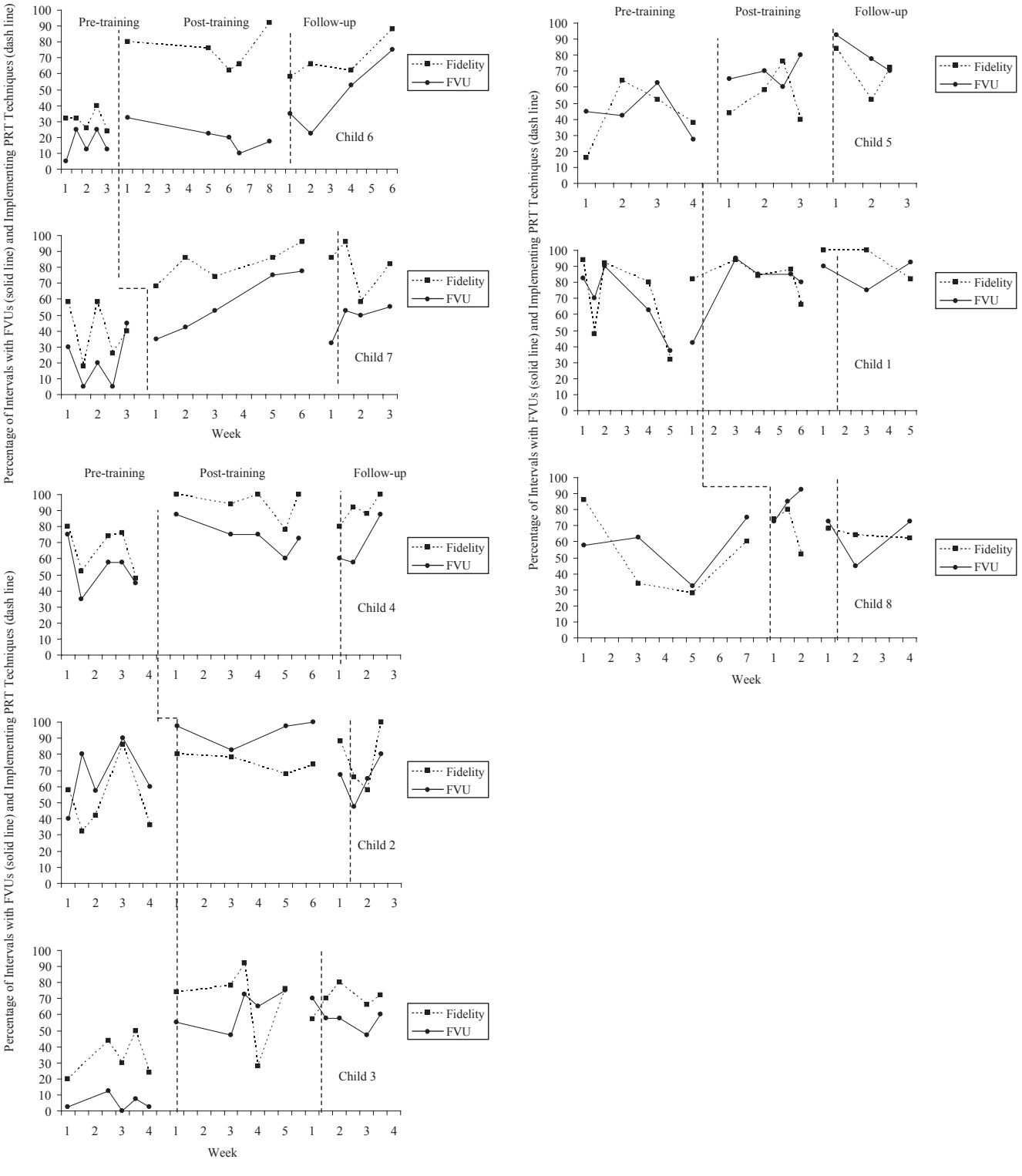

Figure 1 Percentages of intervals during which children produced functional verbal utterances (FVUs) and parents implemented PRT techniques during each video probe, by week of participation in the study. Three to five video probes were taken during each phase (i.e., pre-training, post-training, and follow-up). The order of presentation is based on the length (i.e., 3 to 7 weeks) of the pre-training phase

3.5-month follow-up (mean increase of 2%). Child 6 also displayed some disruptive behaviour, which decreased slightly by the follow-up phase (mean decrease of 5.5% from pre-training to follow-up). Overall, no change was seen in disruptive behaviour between pre- and post-training phases ($Z = -.73$, $p > .05$, $d = .17$) or between post-training and follow-up phases ($Z = -1.18$, $p > .05$, $d = .08$).

Qualitative notes. Parents universally reported positive changes in child communication. The parents of Child 3 noted that he 'seems to be initiating

Table 2 Mean responsivity (number of appropriate responses by number of language opportunities) across the three treatment phases

Child	Pre- training	Post- training	Follow-up
1	130/224	181/239	135/148
	58.04%	75.76%	91.22%
2	107/134	182/206	81/91
	79.85%	88.35%	89.01%
3	8/66	133/169	90/112
	12.12%	78.70%	80.36%
4	130/193	163/213	106/174
	67.36%	76.53%	60.92%
5	65/135	88/144	137/165
	48.15%	61.11%	83.03%
6	18/73	26/101	65/99
	24.66%	25.74%	65.66%
7	25/108	90/129	39/65
	23.15%	69.77%	60.00%
8	128/184	91/101	74/106
	86.49%	90.10%	69.81%
Mean	49.98% (27.75)	70.75% (20.44)	75.00% (12.48)

more … saying words first without any prompting'. Child 6's parent noted that 'she started using a lot of words without prompting. She's saying new words every day'. Child 7's parent reported that 'he understands more'.

Parent outcome measures

Fidelity of PRT implementation. Figure 1 shows that during the pre-training phase, none of the parents met the criterion for fidelity (i.e., implementation of the PRT techniques during a minimum of 75% of the intervals). However, 5 of 8 parents (62.5%; 4 mothers) met the criterion for fidelity during the post-training phase. Four of these parents (50%; 3 mothers) continued to meet the fidelity criterion at follow-up.

More specifically, all parents demonstrated increased skill levels after training, with Parents 1, 2, 4, 6, and 7 meeting the criterion for fidelity post-training. Three parents (Parents 1, 2, and 5) continued to make at least slight gains at follow-up (mean increase of 11.2%, 3.0%, and 14.8%, respectively). The other five parents (Parents 3, 4, 6, 7, and 8) displayed either no change or a slight decrease in fidelity between post-training and follow-up (mean decrease of .6%. 4.4%, 6.7%, 1.5%, and 4.0%, respectively).

Overall, parents' fidelity of implementing PRT techniques improved significantly after training ($Z = -2.25$, $p < .05$, $d = 2.09$; mean change = 27.16%, range = 12.0–44.4%), and this gain was maintained at follow-up ($Z = .0$, $p > .05$, $d = .13$).

Self-efficacy. In general, parents demonstrated high levels of perceived self-efficacy pre-training. However, for the two parents with lower pre-training levels of self-efficacy (Parents 4 and 5, whose scores were at least one SD below the mean of a clinical sample; Hastings & Brown, 2002), scores increased to within the average range by follow-up ($M = 13.0$ and 20.0, for pre- training and follow-up, respectively). Overall, there was no significant difference in parental self-efficacy scores between pre- and post-training ($Z = -.42$, $p > .05$, $d = .32$; $n = 6$), or between post-training and follow-up ($Z = -.95$, $p > .05$, $d = .06$; $n = 6$).

Parent satisfaction. Overall, parents found the whole training experience to be very helpful ($M = 9/10$). They rated the training sessions as being very helpful ($M = 8.7/10$) and the training manual as fairly helpful ($M = 7.1/10$). Parents rated the training in PRT as being more helpful in increasing their child's language ($M = 7.6/10$) than decreasing disruptive behaviour ($M = 5.2/10$). All of the parents' qualitative comments were very positive. For example, one parent stated 'I found the training very helpful. It made me feel much more confident in what I'm doing.' Another parent said 'I'm amazed at how little effort on our part can create such a big change for our child so far.'

Time implementing PRT. Overall, parents reported spending .5 to 2 hours a day implementing PRT with their children, with a range of 4 to 10 hours a week. Note, however, that parents reported that it was difficult to estimate the amount of time they spent doing PRT, because they were incorporating the techniques into routines throughout the day.

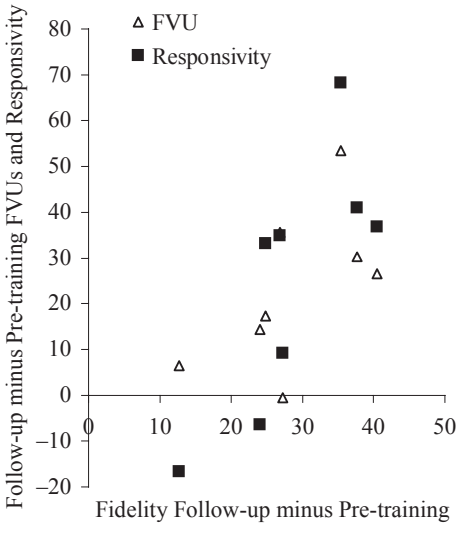

Figure 2 Relationship between change from pre-training to follow-up in mean percentage of intervals during which parents implemented PRT techniques (fidelity), and change in mean percentage of intervals during which the child produced (a) functional verbal utterances (FVUs; triangles) and (b) appropriate child responses (responsivity; squares)

Relationship between parent fidelity and child communication

No significant correlation was found (r_s = .12, p > .05) between changes in parent fidelity and child FVUs from pre-training to post-training. However, parent fidelity and child FVUs were moderately correlated from pre-training to follow-up (r_s = .50, p < .05), indicating that as the fidelity of parents' implementation of PRT skills increased, child FVUs also increased (see Figure 2). Similarly, there was no relationship between changes in parent fidelity and changes in child responsivity from pre- to post-training (r_s = −.05, p > .05). However, there was a strong correlation between pre-training and follow-up (r_s = .88, p < .05), indicating that the degree to which parent PRT skills improved was related to the extent to which child responsivity increased (see Figure 2).

Discussion

The present study is the first to systematically evaluate the efficacy of brief (6-hour) training in PRT for parents of young children with autism. This was accomplished using a non-concurrent multiple baseline (across-participants) design with eight families. The eight preschoolers (1 girl) were all diagnosed with autism and ranged in cognitive and language ability from mildly to severely impaired, with the majority of children falling in the severe range (e.g., with little or no expressive language).

In terms of communication, the overall frequency of child FVUs increased after training and was maintained at the 2- to 4-month follow-up. This finding is consistent with previous studies that have shown increases in children's communication following parent training in PRT (e.g., Laski, Charlop, & Schreibman, 1988; R.L. Koegel et al., 2002; Openden, 2005). Notable, however, is that despite only 6 hours of training, our average increase in FVUs from pre- to post-training (25.8%) is comparable to that reported by Openden (2005) following 20 hours of group parent training (18.5%).

In the present study, gains in FVUs following training were maintained at follow-up, although this varied across the children with autism. Unlike the other children, Child 6, a very young and cognitively delayed child, made minimal gains from pre- to post-training (a short time); however, her gains at follow-up were large. This finding raises the possibility that very young (under 36 months) cognitively delayed children may take longer to respond to treatment than older preschoolers or preschoolers at a more advanced developmental level. Among the remaining children, two (Children 1 and 5) continued to make gains at follow-up, while the others (particularly Children 2 and 8) did not maintain their post-training gains at follow-up. Child 8 was sick for one month during the follow-up period, which might account for the decrease in FVUs. For Child 2, there were fewer language opportunities (i.e., times when the parent creates an opportunity for the child to communicate) during follow-up compared to the post-training phase (91 vs. 206, respectively, as coded from videos). Providing fewer language opportunities likely has a major impact on the percentage of FVUs, as the children were making few initiations (i.e., < 22% of their utterances) and communicating primarily when a language opportunity was provided by their parents. Therefore, decreases in FVUs for Children 2 and 8 may not represent 'true' decreases in communication skills. Conversely, it is important to note that increases in communication did not appear to be attributable to increases in the number of language opportunities provided.

The communication changes reported here were explored further by examining the nature of child utterances. After training and at follow-up, the children were more likely to provide an appropriate response to their parents' prompts (responsivity), instead of responding inappropriately or not at all. This pre- to post-training change in more appropriate responding (20.9%) parallels that obtained following a 20-hour group parent training programme (21.0%; Openden, 2005), and again in our study was maintained at follow-up. When looking specifically at the degree to which the children were prompted to respond, there were no overall changes in model-prompted responses, initiations, or inappropriate responses. However, child responses to indirect prompts, which are higher-level than those modelled directly, increased after training and were maintained at follow-up. Some studies have demonstrated increases in child initiations when they are targeted (e.g., L.K. Koegel, Camarata, Valdez-Menchaca, & R.L. Koegel, 1998; L.K. Koegel, Carter, & R.L. Koegel, 2003). However, these studies examined treatment delivered by clinicians, not parents. Laski and colleagues (1988) found an increase in spontaneity for 4/8 children following 5 to 9 sessions of parent training in the natural language paradigm (an earlier version of PRT). Owing to the brevity of the training in the current study, initiations were not specifically targeted. Thus, it was not surprising that verbal initiations did not show significant change. Some parents did report informally that their child was initiating more (primarily requests) following training.

With regard to standardised test performance, two of the 8 children on the PLS-4, and 3 out of the 5 children testable on the PPVT-III, demonstrated age equivalence increases equal to or greater than expected over a 4- to 6-month period (the duration of the intervention). In addition, there was a trend toward an increase in expressive language, which future studies might replicate with larger numbers.

In the present study, increases in communication were not mirrored by decreases in disruptive behaviour. This was likely due to floor effects, as the majority of children displayed minimal levels of disruptive behaviour throughout the study. For the two children who did demonstrate higher levels of disruptive behaviour prior to training, this decreased either immediately after training or by follow-up.

Looking specifically at parent outcomes, the results from this study indicate that parents' ability to implement PRT techniques increased after brief training and was maintained 2 to 4 months following training. On average, parents' fidelity of implementation score increased by 27% following only 6 hours of training. Prior to training, none of the parents met the criterion for fidelity of implementation (>75%). However, following 6 hours of training, this criterion was met by 5 and 4 of 8 parents at post-training and follow-up, respectively. Although pre-training fidelity scores may have been elevated for parents who completed the More than Words parent training programme (which incorporates child choice, one of five main PRT techniques), the two parents (of Children 1 and 2) who did not were not distinguishable on the basis of their PRT fidelity data. However, we acknowledge that it is unknown whether PRT training was enhanced by the parents' previous More than Words experience.

In comparison, Stahmer and Gist (2001) reported that only 4 of 11 parents who completed 12 hours of PRT training without a support group mastered the techniques. Thus, even though the parents in our study received less training (6 vs. 12 hours), more demonstrated mastery of the techniques post-training (62% vs. 36%). It is unclear why these findings are discrepant, as the characteristics of the participants in the two studies are similar. One difference is that the training provided in the present study was more concentrated (i.e., 6 hours over 2 weeks vs. 12 hours over 12 weeks), which may have enhanced parent learning. Other potential contributing factors include the prior completion of the More than Words programme by most parents in the current study, and cross-study differences in training style.

We also note that both mothers (n = 5) and fathers (n = 3) participated in the present study. Four out of 5 mothers (80%) compared to 1 out of 3 fathers (33%) met the criterion for fidelity of PRT implementation post-training. In related work, Seung, Ashwell, Elder, and Valcante (2006; N = 8) reported no difference between mothers and fathers in the acquisition of two skills for promoting their child's social reciprocity. Unfortunately, the interesting issue of possible sex differences in training uptake remains outstanding, as the small samples in both studies preclude any conclusions.

While parents' ability to implement the PRT techniques increased, there was no overall increase in parental self-efficacy following training. However, most of the parents had high levels of parental self-efficacy throughout the study (which might also have been elevated by their prior participation in parent training). For the two parents who had relatively low parental self-efficacy prior to training (both of whom had completed prior parent training), self-efficacy did increase considerably following training. This suggests that brief parent training in PRT may increase parental self-efficacy for parents who have low self-efficacy from the outset. The lack of change in parental self-efficacy for those remaining could be due to several factors, including a ceiling effect or the use of a questionnaire which focused specifically on parents' perceptions of their ability to handle their child's behaviour problems, which was not the focus of the intervention (and possibly less of an issue in this sample).

Parents reported that the whole training experience was very helpful, particularly in increasing their child's language. The training sessions, which included in vivo feedback, were considered to be more helpful than the manual, which was reported as being fairly helpful. Critical here in planning future training programmes is that parents perceived the training package, particularly the individual sessions, as being highly beneficial. In addition, it will be important for future research to measure parent satisfaction at follow-up as well as immediately after training.

Of the studies that have assessed parent fidelity of implementation, this is one of the few to investigate the relationship between changes in parents' skills and child outcomes. We provide evidence for a relationship between the extent to which parent skill level increased and the magnitude of improvement in child communication following training. This finding, evident on two measures at follow-up, is critical, as it highlights the importance of focusing on fidelity of treatment when providing an intervention or evaluating its impact on children's skill development.

The present multiple-baseline (across-participants) design controls for temporal or developmental effects between pre- and post-training; however, the pre-training phase (3 to 7 weeks) was shorter than the follow-up phase (2 to 4 months). Therefore, development could have contributed to changes between the post-training and follow-up phases. A further limitation is that the design does not allow comparison of brief parent training in PRT to another intervention. Now, with positive preliminary findings, a randomised clinical trial (RCT) would provide stronger evidence for the efficacy of brief parent training in PRT. An RCT would also provide an opportunity to assess the generalizability of our findings, which are based on only 8 parent–child dyads. Most parents who volunteered to participate in this study were of middle to upper-middle socioeconomic status, had previously participated in a parent training programme (i.e., More than Words), and displayed some skill in PRT techniques prior to

training. Therefore, the results may not generalise to other families with preschoolers with autism. However, 8 is considered a large sample for a single-subject design. Moreover, the pattern of changes in both parent and child behaviour, although modest, was fairly consistent across all 8 parent–child dyads, and the compelling relationships between parents' fidelity of treatment and child gains, both strengthen the conclusions drawn from the study.

Finally, the present findings may have implications for clinical practice. In the face of long waiting lists and delays in treatment services, providing parents with early brief training focused on enhancing their children's communication may improve the children's prognosis. We consider these results of parent-implemented PRT to be promising. However, the small effects evident in a recent RCT study investigating another parent training programme are sobering (Green et al., 2010). Future research will help to determine what type and intensity of parent training is required to optimise treatment effects. We are particularly optimistic that training might enhance parents' confidence and self-efficacy in supporting their children's development. Our parent training programme was not resource or time intensive. It might therefore be feasible for families living in both rural and urban areas, and for various professionals who are involved in the care and education of children with autism.

Supplementary material

The following supplementary material is available for this article:

Appendix A. Functional verbal utterance operational definition;

Appendix B. Definitions for the nature of child utterances;

Appendix C. Fidelity of implementation operational definitions (Word document)

This material is available as part of the online article from:

http://onlinelibrary.wiley.com/doi/abs/10.1111/j.1469-7610.2010.02326.x

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Key points

- Training parents in pivotal response treatment/training (PRT) has been shown to increase communication in children with autism.
- To date, most studies have evaluated 25 hours of training, although preliminary evidence suggests that less intensive training may still be effective.
- The current study demonstrates that after brief (6-hour) parent training, child communication and parent skills increased, and generally were maintained 2 to 4 months following training.
- Improvements in parents' ability to implement PRT techniques were associated with improvements in child communication.
- Brief parent training promises to provide an immediate cost-effective intervention that could be adopted widely.

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