

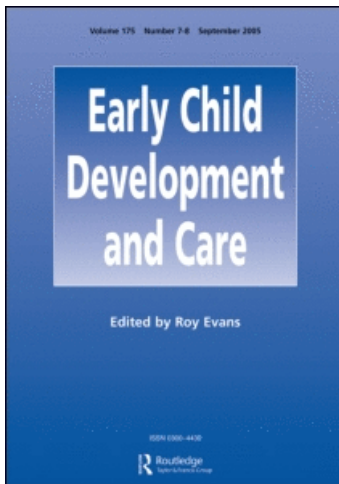
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### Preschoolers with autism spectrum disorders: evaluating the impact of a home-based intervention to promote their communication

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## Preschoolers with autism spectrum disorders: evaluating the impact of a home-based intervention to promote their communication

Roy McConkey<sup>a\*</sup>, Maria Truesdale-Kennedy<sup>a</sup>, Heather Crawford<sup>b†</sup>, Elaine McGreevy<sup>b‡</sup>, Michaela Reavey<sup>c‡</sup> and Arlene Cassidy<sup>d</sup>

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The complexities that practitioners face in evaluating interventions are illustrated in this article. An early intervention programme (known as Keyhole), based mainly around Treatment and Education of Autistic and related Communications handicapped CHildren (TEACCH), Picture Exchange Communication System (PECS) and Hanen approaches, was delivered to 35 families through 15–18 home visits over a nine-month period. In addition, 26 families acted as a contrast group. A range of measures were used on a pre–post basis along with qualitative data from participants. The children as a whole showed significant improvements on different indices of communication and these were greater than those reported in the contrast group. Mothers too improved on measures of health but not of stress. These findings add to the accumulating evidence that family-delivered, communication-based interventions are effective. Lesson for service-based evaluations are drawn; in particular the reasons for the individual variation in children’s and parental responses require closer investigation.

**Keywords:** autism spectrum conditions; communication; ‘home-based intervention’; mothers; preschool children

### Introduction

Parents’ concern about their child’s speech and language development is one of the earliest alerting signs that the child may have an autism spectrum condition (de Giacomo & Fombonne, 1998). Core features of these conditions are communication deficits and delays in speech and language acquisition alongside difficulties in social relationships and imaginative play (Howlin, 1998). Not surprisingly, speech and language therapists are at the fore in assessing and treating these children with support from early childhood educators. However, there is a dearth of evidence regarding the effectiveness of their interventions (Law et al., 2001).

Evidence from the research literature suggests that targeted interventions should begin as early as possible (Buschbacher & Fox, 2003). Studies clearly indicate that children who have intervention before they reach five years of age cope much better than those who receive it later than this. Indeed, some argue that the best results are obtained if the intervention starts before two years of age (Ozand, Alodaib, Merza, & Al Harbi, 2003).

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However, there is less agreement on which approaches are the most effective and in recent years a growing number have become available. Intensive behavioural interventions based around Applied Behaviour Analysis and consisting of up to 40 hours 1:1 teaching per week is probably the most thoroughly evaluated, and impressive gains have been reported with preschool children mostly in centre-based programmes (National Research Council, 2001).

Other approaches have focussed on communication (Tissot & Evans, 2003). Treatment and Education of Autistic and related Communications handicapped CHildren (TEACCH) is a well-established structured teaching approach based on visually mediated learning and the structuring of the learning environment to cue targeted behaviours. Improvements have been reported in communication and social skills alongside reductions in inappropriate behaviours in both centre- and home-based interventions (Mesibov, 1997). Other interventions aimed at promoting communication include the Picture Exchange Communication System (PECS), which has been shown to be effective in promoting non-verbal communication intent and initiation as well as facilitating the development of spoken words (Charlop-Christy, Carpenter, Le, Leblanc, & Kelle, 2002). The Hanan *'More than Words'* programme is an eclectic approach based around recent research on parent-child interaction which encourages parents to attune their communications to those of the child (Pepper & Weizman, 2004).

There is widespread agreement that partnership working with parents of preschool children is crucial in any form of intervention (Christie & Chandler, 2002) yet there have been only a few studies that have demonstrated developmental gains for the child resulting from parental guidance and training (Goldstein, 2002; Medhurst & Beresford, 2007). Fears that these approaches may place parents under greater stress appear unfounded (Küçüker, 2006; Smith, Buch, & Gamby, 2000).

However, less well understood is how these approaches can be integrated into current service practices and evidence obtained for their effectiveness within these settings. Webster, Feiler, and Webster (2003) identified the need for practitioners to create cultures for identifying good practice; addressing gaps in our understanding and shortcomings in present practice. Stahmer, Collings and Palinkas (2005) reported that few front-line providers of early intervention had an understanding of evidence-based practice. Moreover, they noted that practitioners often combined different approaches and they adapted them to the perceived needs of individual children, without monitoring the consequent impact on the child or parent.

Practitioner evaluation of interventions is beset by many difficulties which may explain their reliance on special research projects. Single-case designs may be manageable but a frequent criticism is the lack of replication across the variety of children who are labelled with Autism Spectrum Disorder (ASD) (Lord, 2000). Recruiting a control or contrast group that does not receive the intervention poses additional challenges although it is an essential requirement to rule out progress that may have occurred with the passing of time.

Another challenge is in terms of the measures used to assess the child's progress. These need to be reliable and valid as well as being relevant to the outcomes of the intervention but independent of them, otherwise the risk is that the participants are trained on the chosen measures. Fortunately as research in this area evolves, certain measures have come to the fore.

Lastly, the impact on parents of interventions has been relatively neglected by studies focussed on specific therapies and yet it is essential given the current emphasis on family-focussed services (Sloper, 1999).

In sum, service-based evaluation of early childhood interventions in ASD is in its infancy. The present study attempted to undertake a well-controlled evaluation of a home-based intervention programme for preschoolers with ASD, albeit with limited extra resources to do so. This article serves two purposes. It describes the approaches used in the evaluation as a model that could be replicated by other services. It reports the findings of the intervention and the refinements to service delivery that are required.

## Method

### *Aims of the study*

The main aim was to evaluate a home-based intervention to preschool children with a confirmed diagnosis of ASD and delivered by two specially appointed early intervention therapists both of whom were qualified speech and language therapists with an interest and expertise in ASD. The present study built on existing knowledge and good practice in communication-based interventions specifically designed for children presenting with ASD, based primarily around TEACCH approaches and other communication methods such as Hanen and PECS.

The intervention included children from two years of age; it commenced soon after diagnosis (Christie & Chandler, 2002) and involved working at home with parents over a significant period of time; for up to nine months (Luiselli, Cannon, Ellis, & Sisson, 2000). It was intended to be a model of the type of service that could be realistically provided to families by speech and language therapy services in the UK, although the development and evaluation of this new service was funded through special project monies, obtained by an autism charity on a pilot basis from central government and a local Health and Social Services Board. Advice and assistance in data gathering and analysis was obtained from a local University.

Although the evaluation was undertaken largely within the resources available to services, attempts were made to overcome some of the shortcomings in past evaluations (Jordan, 1999). For example:

- The intervention was delivered by two different therapists in two separate geographical areas so that the replication of the intervention could be studied.
- A total of 36 families were recruited to the pilot service so that a range of children and families took part.
- A contrast group of 26 families was recruited to control for time effects.
- A range of outcomes measures, involving a quasi-multiple baseline design, were taken with both groups.
- The measures covered parental perceptions and well-being as well as the children's development.
- Independent personnel who had not been involved in delivering the intervention collected the post-intervention data.

However, it was not possible to allocate families randomly to the two groupings due to ethical considerations nor were the resources available to conduct longitudinal follow-up studies, although this would be desirable (Francis, 2005).

### *Ethical considerations*

Formal ethical approval was not sought for the study as advice at the time of commencement was that it constituted a service audit of commonly used interventions. However, senior personnel in the participating Trusts and the University of Ulster scrutinised all procedures and especially issues around informed consent.

All the families in two defined geographical areas were consecutively offered the home-based programme after their child had been diagnosed through a multi-disciplinary assessment process as having ASD. This was done until all the available places were taken, as defined by the case-load of the home-intervention therapists.

Families in the two contrast groups were recruited after the special projects had ended. Half of the families came from the same area in which the home-based service had been provided but after it had finished. The remaining families in the contrast group lived in different areas where the intervention programme was not available. This overcame the ethical issue

of withholding an intervention from families although it did prolong the time-scale for the study by 12 months.

All families were told the reasons for evaluating the programme and their participation in it. They could terminate their involvement at any time without giving a reason and this would not affect their access to services now or in the future. All details given were confidential to the external researcher from the University and no one would be identified in any reports.

### ***Criteria for inclusion***

Participants in both groups had to meet the following criteria. The children had a confirmed diagnosis of ASD from a specialist clinic that served the geographical area in which the project was located. The children were not older than four years of age and should not be attending nursery school (although attendance at a playgroup was permitted). Those participating in the Programme would not be in receipt of Speech and Language Therapy services provided by the Health and Social Care (HSC) Trusts in which the project was located. The families had to consent to taking part in both the intervention and its evaluation, and to being interviewed at home by a university researcher.

### ***Recruitment***

In all, 24 families were recruited to take part in the home-based programme based in one HSC Trust area in Northern Ireland and 16 in a second HSC area. However, two parents dropped out after two visits because they were unable to commit to the full programme of visits and three at around the mid-way stage. These mothers gave the following reasons: the child's problems had been resolved when he was started on Ritalin; the family was starting a home-based ABA programme, and the child was not making any progress. Hence, 35 families (88%) completed the programme.

In addition, 26 families were recruited to act as a contrast group of whom 15 (58%) were offered five home visits during which general information about autism was given and they were provided with a set of educational toys and equipment with written suggestions on their use. The other 11 (42%) families received no additional services or supports. As subsequent data analysis revealed few significant differences between these two groups, participants were combined to form one contrast group.

### ***The home-based intervention***

The Intervention Programme, known as 'Keyhole' (Crawford, Doherty, Crozier, & Cassidy, 2006), was developed by a multidisciplinary group of personnel with training and experience of ASD in the early years. This included a speech and language therapist, educator and psychologist. They also formed the Steering group for the evaluation which was planned in conjunction with University personnel. This started before the service commenced and regular meetings were held until the project was completed.

The Programme embodied the six core features that appear to be common in effective educational interventions (Iovannone, Dunlap, Huber, & Kincald, 2003), namely individualised supports, systematic instruction, structured learning environments, specialised curriculum content, functional approach to problem behaviours and family involvement. Particular emphasis was placed on enhancing communication using visual strategies and turn-taking approaches.

The intervention started with all families a short time after the child's diagnosis at a specialist clinic (range one week to three months). It was delivered in two areas by two different speech and language therapists with experience and interest in autism who were recruited specifically to

provide the service. The same content and schedule of visits were followed although these were modified according to the needs of the child and mother. Each visit lasted 90 minutes on average. There were three main phases.

### *Phase 1: information about ASD*

A maximum of four visits was made at weekly intervals. On the first two visits, the child's diagnosis was discussed in detail and every attempt was made to answer mothers' questions around autism and the impact on their child's future. An Information Pack was given to each family with details of local support groups, social security benefits, reading/resource lists and a magazine detailing current national and local issues and events.

Questionnaires related to the evaluation were also completed on these visits. On the third or fourth visit, communication issues specifically relating to autism were discussed with mothers, as were sensory processing difficulties. Suitable checklists were used, for example, the 'how' and 'why my child communicates' checklists from the Hanen Programme. The preferred learning style of the child was discussed as was the importance of visual strategies to promote learning, positive behaviour and communication.

A key role of the Early Intervention Therapist during these early visits was to get to know the family; to listen to parents and to provide support and encouragement that would help them through their difficulties with acceptance of the diagnosis of autism and the future consequences.

### *Phase 2: the intervention stage*

This phase lasted for around 10–12 visits held at fortnightly intervals. Following on from the various assessments, joint aims and objectives were identified for the child in collaboration with mothers. However, common goals across all the children were:

- (1) to develop a consistent communication system;
- (2) to develop the child's ability to co-operate for 1:1 teaching and the teaching of new skills;
- (3) to develop the child's comprehension of environments, especially at home; and
- (4) to develop parental skills in behaviour management and strategies to promote learning outcomes.

During these sessions, video-recordings were made to assist mothers' observations of the child and of their own behaviours during the activities. Visual schedules were set up for all children based on the principles of the TEACCH Programme. The schedules helped to promote the child's understanding of their environment, of language and the routine of the day. They prepared the children for change and encouraged flexibility by providing a methodology and structure within which the child could cope. The schedules helped to encourage positive behaviour, reduce anxiety and tantrums and help promote the concept of 'finish'. Positive routines were established with each child to promote learning and reduce behavioural difficulties. These routines included: First/Then; working left to right; working top to bottom; checking schedule and using a work system.

Visual communication strategies were introduced (based on TEACCH and ICON – ICAN) to facilitate the child's understanding and in some cases to manage behaviour. Strategies included Wait card/Visual timers/Countdown strips/Positive behavioural directives/International 'no' symbol. Methods based on the PECS were introduced to develop initiation and expressive communication skills in accordance with each child's progress. PECS was initially taught in structured situations using highly reinforcing items such as favourite toys but then was generalised into the more natural environment of the home. Object exchange systems were introduced for some children as a prelude to PECS.

In later sessions of the Programme, difficulties with toileting, dressing, eating and sleeping were addressed at the parents' request.

The amount of time mothers spent using the recommended procedures was not prescribed nor were they asked to maintain any formal records although they did give verbal reports at each meeting.

### *Phase 3: carry over to other services*

Families received between one to four follow-up visits on a monthly basis to plan the withdrawal of home visiting and encourage the child's placement in playgroup or nursery school. For those children attending a playgroup during the Programme, the therapists spent time observing the child in this environment, meeting with Playgroup staff and implementing visual strategies into Playgroup. With those children who would soon enter a Playgroup or mainstream Nursery placements after completing the Programme, the therapist also visited to brief the staff and advise on strategies to help the child. Children requiring continuing therapy were referred to the appropriate HSC Trust and/or links were made with the appropriate educational support services.

### *Summary of visits*

In all 17 children received 18 home visits over an 11-month period; 15 children received 15 home visits over a 9-month period and 3 children received 15 home visits over a 6-month period with one follow-up visit following discharge from the project. This variation was due to time constraints on the therapists and the length of time funding was available for the project.

## **Participants**

### *Children*

All the children in the study had a confirmed diagnosis of ASD. Overall, there were no differences across the Programme and Contrast groups on the following characteristics. In all, 55 (90%) were boys and 6 were girls (10%). Eight children (13%) were reported to have a sensory impairment; 8 (13%) had epilepsy and 1 (2%) had a physical impairment. Thirteen (21%) were the only children in the family, 26 (43%) had one sibling and 22 (36%) had two or more siblings. In 13 families (21%), other children were reported to have similar difficulties to the participating child including one set of twins who participated in the Programme.

However, the children in the contrast group were significantly older: mean age 3.4 years compared with a mean of 2.8 years for the programme group. In all, 20 (57%) children in the Programme group were two years of age at its commencement and 15 (43%) were aged three years. In the contrast group, seven children (27%) were aged two years, 15 (58%) were three years old and four (15%) were aged four years. Further details of the children's characteristics are provided in the results section.

### *Mothers*

Overall, 12 single mothers participated in the study with significantly more in the programme group ( $n = 11$ ; 34% of group) than in the contrast group ( $n = 1$ ; 4%). There were no other differences across the two groups on other characteristics of mothers. Of the 60 mothers; 14 (23%) were aged 20–29 years; 36 (60%) 30–39 years and 7 (12%) 40–49 years (three mothers did not disclose personal details). In all, 22 (37%) had completed third level education; 28 (47%) had taken GCSEs and seven (12%) left school without qualifications. Forty-four families (73%) owned their own homes with seven (13%) renting and four (7%) living with their parents. There was a

wage-earner in 36 (64%) of families but not in 20 (36.0%). The latter group had a higher proportion of single mothers.

At Time 2 the mothers were asked to identify the different professionals with whom they had had contact in the previous 12 months. There was no difference between the two groups who had seen a mean of two different professionals (range 0–7). Similarly, there was no difference in the number of informal supports both groups of families had received (mean 1.7; range 0–5).

### **Measures of children's functioning**

A number of standardised scales were chosen to assess changes in the children over time. The selection was based on previous use in evaluation studies, evidence of reliability and validity, and coverage of specific skills as well as broad developmental domains.

#### ***Psycho-Educational Profile – Revised (PEP-R)***

This is a developmental assessment that is intended to identify the learning style, strengths and deficits in children with autism or related development disorders with a view to planning educational goals. It has been used in previous evaluation studies (Ozonoff & Cathcart, 1998).

The PEP-R provides developmental levels in seven areas: Imitation, Perception, Fine Motor, Gross Motor, Eye-Hand Integration, Cognitive Performance and Cognitive Verbal Skills (Schopler, Reichler, Bashford, Lansing, & Marcus, 1990). All the children in the programme group were initially assessed by the home therapist at the start of the programme and by an independent assessor familiar with the test and preschool children, three months after the intervention had ended. Although she was aware that the children had participated in the programme, she did not have access to their initial assessments on this scale. However, comparable PEP-R data were not collected for children in the Contrast group as clinicians felt it would be too intrusive for the families and the child to have an assessor come to the home.

#### ***Gilliam Autism Rating Scale***

This scale assesses particular features of autism based on parental reports. Behaviours are grouped into four subscales: Stereotyped Behaviours, Communication, Social Interaction and Developmental Disturbances (Gilliam, 2001). Coefficients of reliability (internal consistency and test–retest) for the subscales and entire test range from .81 to .88. Summary scores can be derived in terms of percentiles and an autism quotient which is deemed to be the most reliable of all the scores generated on this scale. A score of 90 and above is deemed to be indicative of autism with scores in excess of 111 highly indicative. However, a subsequent validation study by South et al. (2002) suggested that quotient scores may underestimate the likelihood of children having ASD.

#### ***Vineland Adaptive Behaviour Scale***

The scale contains 297 items grouped into four domains: communication, daily living skills, socialisation and motor skills. Items are presented in developmental order within each domain and parental ratings are used to determine a total subscore within each domain as well as an overall score for adaptive behaviours. These can be converted to standard scores (Mean 100) using age norms provided in the Test Manual. Based on a nationally representative sample in the USA of children aged 2 to 5 ( $n = 600$ ), reliabilities for each of the four domains range from .78 to .92 (Sparrow, Balla, & Cicchetti, 1984).



## Parental measures

In addition, two measures were used to assess parental well-being using similar selection criteria as for the children's measures.

### *Questionnaire on Resources and Stress (QRS-F)*

This scale was specifically designed to measure the impact of a developmentally delayed or 'mentally retarded child' on the family and has been widely used in family research in autism with good reliability (in excess of .85) and convergent validity (Honey, Hastings, & McConachie, 2005). A higher total score is indicative of greater stress (Friedrich, Greenberg, & Crnic, 1983).

### *The General Health Questionnaire*

This is a 28-item questionnaire recommended for the assessment of psychiatric morbidity (Goldberg & Williams, 1991). The total score was obtained by summing up the scores of the items rated on a five-point scale. A score of >8 is usually considered to be indicative of poor health. Based on UK samples, the test-retest reliability was .90 and the split-half reliability was found to be .95 (sample  $n = 853$ ).

### *Parental perceptions*

A semi-structured interview schedule was drawn up to obtain parental perceptions of the Programme. Also a structured rating scale was used to identify the problems they experienced with their child at home.

## Procedure

Data on the above measures were collected through individual interviews with parents. This was done by the therapists during the initial visits to the family home. Three months after the final home visit, the measures were repeated; this was to avoid any halo effects arising from the Programme. On this occasion a university researcher visited the family home. Families in the Contrast group were also interviewed by a university researcher on two occasions after an equivalent interval of time (usually 12 months). Over both groups, respondents at Time 1 were mainly mothers ( $n = 45$ : 74%) but both parents ( $n = 14$ : 23%) and two fathers (35) also took part. At Time 2 informants were mostly mothers ( $n = 56$ : 92%) along with four couples (7%) and one father (2%).

## Results

### *Data analysis*

The impact of the home-based programme was judged in two main ways: through parents' opinions of the intervention programme and by comparisons on a range of measures before and after the Programme. Parents' responses in the semi-structured interviews were analysed thematically.

Comparisons between participants' scores on quantitative measures in the Programme and contrast groups at the two time points were tested using *t*-tests or repeated measures ANOVA as appropriate. In order to correct the imbalance in the two groups in terms of children's age and mother's marital status, these variables were used as co-variates in the ANOVA. However, when homogeneity of variance was not attained, Wilcoxon Signed Ranks tests or Mann-Whitney *U* tests were used instead.

As there were few differences found between the two groups who received the Programme from two different therapists, they were combined into the one Programme group. Likewise,

there were few differences between the two contrast groups and they too were treated as one Contrast Group. Data was missing on a certain of the measures for families in both the Programme ( $n = 3$ ) and Contrast groups ( $n = 5$ ) at either Time 1 or Time 2. Hence, there can be slight variations on the number of parents for whom data is reported.

### *Parents' opinions of the programme*

This information was obtained by a university researcher visiting the family home and interviewing the mother ( $n = 34$  mothers of 35 children). In addition, one of the five mothers who dropped out also agreed to be interviewed; the others declined. All mothers felt that the child had benefited by learning new things through the Programme whereas 31 (91%) felt the family as a whole had benefited. They mentioned in particular the information supplied about autism and the emotional support and advice provided. Also 30 mothers (88%) felt their attitude to the child had changed as a result of Programme, such as becoming more understanding and patient of the child's difficulties.

Nearly all were satisfied with the home visitor's knowledge and skills, the way she went about her work, the notes she left after the visit and the time of day when she visited.

However, a minority were dissatisfied with certain features of the programme: 14 parents (41%) did not like the video-recordings (and these were not used in the second area); 8 (24%) would like more sessions and 6 (18%) were not satisfied with the hand-over arrangements. However, all 34 parents who completed the programme would recommend it to other families.

### *Changes in the children and parents*

#### *PEP-R assessments*

The two therapists had initially assessed the children using the PEP-R during their first visits to the family home although at this time, three children were not able to be fully assessed. Three months after the last home visits, arrangements were made for the children to be re-assessed on the PEP-R by an independent assessor who was familiar with the test and preschool children with ASD.

Paired  $t$ -tests were used to compare the number of items the child had passed on the seven subscales at Time 1 and Time 2 ( $n = 32$ ). These showed significant improvements in all the subscales as Table 1 shows. The mean 'developmental age' also rose significantly from 20.1 months (SD 7.4) to 29.7 months (SD 11.2) ( $t = 5.57, p < .001$ ). In addition, the three children who were 'untestable' at Time 1 were able to be scored at Time 2 although their data could not be used for the statistical comparisons.

Table 1. The mean scores (and standard deviations) for the Programme Group on the subscales of the PEP-R at the two time points.

Subscale	Mean (SD) Time 1	Mean (SD) Time 2	Statistical tests
Imitation	4.9 (4.7)	8.8 (5.0)	$t = 4.97, p < .001$
Perception	7.9 (3.3)	10.4 (3.1)	$t = 4.66, p < .001$
Fine-motor	7.07 (3.5)	10.5 (3.8)	$t = 5.44, p < .001$
Gross-motor	10.8 (3.4)	15.0 (3.5)	$t = 5.48, p < .001$
Eye-hand	4.2 (2.7)	7.0 (3.1)	$t = 6.19, p < .001$
Cognitive – non-verbal	5.2 (4.6)	12.2 (6.4)	$t = 6.77, p < .001$
Cognitive – verbal	2.8 (3.7)	7.57 (5.8)	$t = 5.32, p < .001$

Table 2. The percentage of children with problems reported to be 'getting better' in each group and at the two time points.

Behaviour	Group	Time 1 (%)	Time 2 (%)	Statistical tests Times 1 and 2
Problems with language	Programme	2.8*	60	$z = 4.47, p < .001$
	Contrast	32.1*	41.7	Not significant
Problems with play	Programme	2.8	54.3	$z = 4.27, p < .001$
	Contrast	17.9	37.5	$z = 2.92, p < .005$
Relating to other people	Programme	8.3	25.7	$z = 2.86, p < .005$
	Contrast	21.4	29.2	Not significant
Unusual interest in toys/objects	Programme	5.6	22.9	Not significant
	Contrast	3.7	16.7	Not significant
Difficulty in imitating	Programme	2.8*	22.9	$z = 3.07, p < .005$
	Contrast	25.0*	29.2	Not significant
Adaptation to change	Programme	5.6	45.7	Not significant
	Contrast	17.9	25.0	Not significant

\*Chi Square significant  $p < .01$  comparing Programme and Contrast groups at Time 1.

### *Perceived difficulties for child*

Parents identified from a listing of six problems those which were difficulties for the child; those that had been difficulties but they felt were now getting better and those that were not a problem (see Table 2). At Time 2, the Programme group had a significantly greater drop in the number of problems reported (from Time 1 Mean = 4.6 (SD 1.3) to Time 2 Mean = 2.1 (SD 1.7)) (Wilcoxon Signed Ranks tests:  $z = 4.47, p < .001$ ) compared to the Contrast Groups (Time 1 Mean = 3.5 (SD 1.6) to Time 2 Mean = 2.5 (SD 1.9)) ( $z = 1.99, p < .05$ ). Conversely, parents in the programme group reported a significant increase in the number of problems reported to be 'getting better': from a Time 1 Mean = .3 (SD .6) to Time 2 Mean = 2.3 (SD 1.6) ( $z = 4.47, p < .001$ ), whereas there was no significant change in comparable totals for the contrast groups (Time 1 Mean = 1.0 (SD 1.2) to Time 2 Mean = 1.7 (SD 1.6)) ( $z = 1.59$ ).

Changes in parents ratings were further investigated for each type of difficulty by assigning a score of 1 for no problems, 2 for getting better and 3 for still a problem. Wilcoxon Signed Ranks tests were again used to ascertain if the changes for each group were significant. As Table 2 shows, a higher percentage of parents in the contrast groups reported the children were 'getting better' on language and imitation at Time 1 compared to the programme groups but the percentages were comparable at Time 2. However, only parents in the Programme group reported significant improvements from Time 1 to Time 2 on language, imitation and relating to others. Both groups improved on ratings of improvements in play.

### *Vineland Adaptive Behaviour Scores*

Standardised scores were calculated for each of the four subscales on this test as well as total scores using the norms provided in the most recent edition of the Vineland Scale (Sparrow et al., 1984). Repeated measure ANOVAs were used to determine the significant of differences over time (for both groups) but especially for the interaction of Groups by Time.

As Table 3 shows, mothers rated children's communication and daily living skills in the programme group significantly higher at Time 2 than at Time 1, whereas the scores for the contrast

Table 3. The mean standard scores (and standard deviations) for each group at the two time points on Vineland Adaptive Behaviour Scale and on measures from Gilliam Autism Rating Scale (GARS).

Scale	Group	Mean (SD) Time 1	Mean (SD) Time 2	Statistical tests
Vineland – communication	Programme	61.5 (8.2)	69.5 (16.2)	T: $F = 2.89$ , NS
	Contrast	62.6 (11.9)	60.7 (12.3)	G×T: $F = 7.83$ , $p < .01$
Vineland – socialisation	Programme	63.7 (8.8)	75.9 (20.6)	T: $F = 13.4$ , $p < .001$
	Contrast	64.2 (8.5)	69.5 (13.1)	G×T: $F = 2.10$ , NS
Vineland – daily living	Programme	65.9 (8.9)	71.2 (15.5)	T: $F = .62$ , NS
	Contrast	68.5 (14.8)	66.1 (15.3)	G×T: $F = 4.54$ , $p < .05$
Vineland – motor skills	Programme	75.7 (16.4)	78.1 (20.1)	T: $F = .08$ , NS
	Contrast	77.0 (16.6)	72.9 (18.5)	G×T: $F = 1.22$ , NS
Vineland – adaptive behaviour	Programme	61.3 (8.5)	67.7 (11.8)	T: $F = 2.30$ , NS
	Contrast	62.3 (9.6)	61.7 (11.8)	G×T: $F = 3.4$ , $p < .08$
GARS – autism quotient	Programme	85.4 (15.3)	89.2 (13.2)	T: $F = 12.05$ , $p < .001$
	Contrast	88.6 (10.9)	99.4 (20.4)	G×T: $F = 2.79$ , $p < .100$
GARS – percentile scores	Programme	24.9 (25.2)	29.7 (25.2)	T: $F = 1.00$ , $p < .005$
	Contrast	27.1 (18.1)	48.1 (31.4)	G×T: $F = 4.93$ , $p < .05$

Note: T = overall effect of time; G×T = interaction of groups and time; NS = not significant.

groups did not change. These effects still held when child's age and marital status of mother were entered as co-variables.

Although both groups also showed a significant improvement in their Socialisation scores, this effect no longer held when child's age and marital status were entered as co-variants. Similarly, the nearly significant effect for a greater improvement with the Programme Group on the overall adaptive behaviour score no longer held when the co-variables were added in.

On all the Vineland measures, the standard deviations rose markedly at Time 2 for children in the Programme group but not for the Contrast group which indicates that certain children improved more so than did others. However, no significant correlates were found with improvements either in terms of child or parent characteristics.

### *Gilliam Autism Rating Scale*

This scale assesses particular features of autism based on parental reports. An autism quotient can be calculated; this is deemed to be the most reliable of all the scores generated on this scale. As noted earlier, scores of 90 and above are deemed to be indicative of autism with scores in excess of 111 highly indicative although other research suggests these may be set too high.

As Table 3 shows, the autism quotient for all the children rose significantly over time, which may reflect the children's symptoms becoming clearer as the child gets older. However, those children in the contrast group tended to rise more than those did in the Programme Group. The same effect was significant in percentile scores; in which higher scores indicate more autistic symptoms. However, these differences did not hold when the child's age and mother's marital status were entered as co-variables.

### *Maternal well-being*

Mothers completed the General Health Questionnaire (28-item version) on two occasions. As Table 4 shows, although there tended to be an overall reduction in scores over time (which is

Table 4. The mean standard scores (and standard deviations) for each group and at the two time points on General Health Questionnaire (GHQ) and Questionnaire of Resources and Stress (QRS).

Scale	Group	Mean (SD) Time 1	Mean (SD) Time 2	Statistical tests
GHQ – overall score	Programme	7.2 (4.4)	1.6 (2.3)	T: $F = 12.07, p < .001$
	Contrast	5.7 (4.4)	5.3 (6.0)	G×T: $F = 8.40, p < .01$
GHQ – somatic	Programme	2.8 (1.4)	.5 (.8)	T: $F = 7.28, p < .05$
	Contrast	1.7 (1.7)	1.8 (2.4)	G×T: $F = 10.09, p < .005$
GHQ – anxiety	Programme	2.7 (2.1)	.9 (1.8)	T: $F = 5.19, p < .05$
	Contrast	2.3 (2.2)	2.4 (2.4)	G×T: $F = 5.72, p < .05$
QRS total score	Programme	8.7 (7.6)	14.3 (6.5)	T: $F = 2.66, NS$
	Contrast	16.6 (6.2)	16.0 (7.6)	G×T: $F = 3.94, p < .06$

Note: T = overall effect of time; G×T = interaction of groups and time; NS = not significant.

indicative of better health), this was much more marked for mothers in the Programme group than in the contrast group. This change was particularly evident in the subscales on somatic symptoms and anxiety. The significant differences were maintained when child’s age and marital status were entered as co-variables.

However, on the Stress questionnaire, mothers in the Programme group tended to have significantly higher scores – indicative of greater stress – at Time 2 compared to Time 1 although their scores were comparable to those of mothers in the contrast group at both time points. This difference was also maintained when the co-variables were entered.

**Discussion**

This study has demonstrated that with careful planning and some additionally of resource to assist with data gathering and analysis, it is possible to undertake a service-based evaluation of innovative interventions. Three main conclusions can be drawn about the intervention from the data obtained.

First, it had a particular impact on the children’s communication and related functioning as measured by the PEP-R evaluations, parental ratings of improvements in children’s problems; and the children’s scores on communications and daily living subscales of the Vineland. Children in the contrast group did not show similar improvements nor did the children in the Programme group improve on other subscales of the Vineland which if they had done so, would have suggested generalised developmental growth rather than a specific effect. Moreover, there was some evidence that mothers benefited in terms of self-ratings on the General Health Questionnaire although ironically their stress scores increased; a point to be discussed later. Finally, these results were replicated for parents in two different areas and with different therapists.

Second, certain children showed more evident improvements on these measures than did other children, as reflected in the higher standard deviations on all the measures taken after the intervention. Similar changes were not found for the children in the contrast group. However, no correlates were found to account for the variation in the Programme children although the relatively small sample size may have precluded significant effects from emerging.

Third, as found in previous studies, the children retained many autistic features as reflected in parental ratings. This may also account for the increased scores on the measure of stress in that parents may have been made more aware of their child’s difficulties as a result of their participation in the programme. Even so, the stress scores are lower than those reported for parents involved in home-based behavioural interventions as reported by Hastings and Johnson (2001)

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and for a sample of Turkish mothers (Küçüker, 2006). This finding suggests that certain autistic behaviours are not easily ameliorated even in the preschool years. Rather the emphasis has to be on helping the child and families to manage better these behaviours.

Even so a number of methodological shortcomings remained in the evaluations undertaken. No measures were taken of the parents' compliance with the advice provided and of the extent to which they used the approaches at home. This may well account for some of the variation found among the children's progress. Parental compliance might be assessed from self-reports, diary records or from sample video-recordings made during the home visits although even these may not give an accurate portrayal of their typical use by the families. Practitioners need to become more adept at gathering such information as part of their routine record-keeping.

Identifying suitable measures for assessing children's progress in the preschool years also proved problematic. In retrospect, the decision not to use the PEP-R scales with the contrast group was wrong as this provided the only independent assessment of the child. Indeed, the reliance on parental assessments in this study may need to be complemented by other assessment tools that reflect the child's competence in natural as well as clinical or teaching settings. Again, observations based on video-recordings may prove helpful even though these may be difficult to standardise in terms of the context in which the children are observed. But it is an approach that is available to practitioners and would be preferable to administering a battery of psychological tests which has been the main approach used to date (e.g. Sallows & Graupner, 2005).

In this evaluation more careful matching of the contrast group to the intervention group would be desirable but this can be hard to achieve in practice when the number of suitable and willing candidates is limited.

Moreover, a more potent comparison would have been with an alternative therapeutic approach rather than a 'no-treatment' contrast group. For example, Howard, Sparkman, Cohen, Green, and Stanislaw (2005) contrasted a centred-based intensive behaviour analytic intervention with 'autism educational programs' based around PECS and TEACCH. Greater gains were reported for children in receipt of the former. However, contrast studies pose major logistical problems for services; for example, having therapists available with sufficient expertise in differing intervention approaches and gaining parental agreement to random allocation to treatment conditions. Perhaps both these issues will be less constraining as service provision develops for this client group.

Also the possibility that particular approaches might be better suited to certain children and families requires greater attention than it has received to date (Fletcher-Campbell, 2003). In most studies, this one included, children in receipt of any form of intervention show marked differences in the gains they make as reflected in standard deviations on the measures (e.g. Howard et al., 2005). Given the variation in child and family characteristics among even a preschool population, large scale, multi-site studies will be required to identify significant relationships. A pre-requisite would be the use of common set of measures to record progress and the participation of practitioners with access to the identified target population.

All these proposed improvements illustrate well the complexity of ascertaining the impact of a common therapeutic approach across groups of preschoolers. Even then, questions regarding the efficiency of treatments still remain, namely how much therapeutic effort is required to produce a significant effect? Studies using intensive behavioural approaches have entailed up to 40 hours, structured 1:1 teaching per week over a 24-month period (e.g. Howard et al., 2005; Sallows & Graupner, 2005). By contrast, the intervention gains produced in this study resulted from a maximum of 36 hours contact between the therapist and each family over an average period of nine months. Of course, it is possible that more children might have improved had they received a greater number of home visits per month or over a longer period of time. But this would have meant certain families receiving a greater share of a scarce resource and raises issues about how long an intervention is continued when there is little or no apparent progress?

Home-based interventions may also need to be complemented with other forms of support to families and to mainstream service personnel (Whitaker, 2002). The 'Keyhole' programme also offers parent support groups aimed especially at families who have just received a diagnosis of ASD and a training package for use with staff working in various early childhood education settings, notably playgroups (Crawford, Doherty, Crozier, Bhurgri, & McConkey, 2003).

In summary, there is accumulating evidence of the effectiveness of home-based interventions based around structured communication for preschool children with ASD. Making these approaches available to greater numbers of families who could benefit from them is in itself a particular challenge for speech and language therapists and early childhood educators. But in meeting this challenge, greater attention needs to be paid to identifying the reasons for individual variation in responses to particular interventions; increasing therapists' skills in using a range of approaches including ABA and evaluating the efficiency of treatments within the resource constraints of services facing increased number of referrals.

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