

# Efficacy of Communication DEALL—An Indigenous Early Intervention Program for Children with Autism Spectrum Disorders

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## Abstract

**Objective** To establish the efficacy of Communication DEALL, an indigenous early intervention program; in the management of children with autism spectrum disorders (ASD).

**Methods** ABA design of pre intervention assessment, intervention and post intervention assessment was utilized, across an 8 month period. The first set of measures covered the assessment of developmental skills in the eight areas of gross motor skills, fine motor skills, activities of daily life skills, receptive language, and expressive language, cognitive, social and emotional skills. The second independent measure was the rating of each child on the Childhood Autism Rating Scale. Parental observations and parental estimation of the child's progress were also recorded. The study was conducted in the Com DEALL units in Bangalore, including thirty subjects diagnosed with ASD. Main Outcome Measures were developmental skill gains and decrease in behavioral issues.

**Results** Statistically significant increase in all eight developmental domains and statistically significant decrease in behavioral symptoms as measured by the CARS, were seen.

**Conclusions** Thus, the Communication DEALL program shows promise as an effective early intervention program. It also indicates a need to further enhance the stabilization of

the pre linguistic skills such as maintenance of eye contact, attention, sitting tolerance and compliance, in the program.

**Keywords** Autism spectrum disorders · Early intervention · Efficacy

## Introduction

It is now recognized that the incidence of the Autism Spectrum Disorders is showing a huge increase from an estimated range of 4 per 10,000 forty years ago to a current estimate of 30–60 cases per 10,000 [1]. Similar increases have been reported in India and in South East Asia too. As of date intensive early intervention is documented to be the most promising approach for alleviation of these disorders [2, 3]. Given this steep increase in incidence it is crucial that we increase awareness of the importance of early identification leading to early intensive intervention. There are some well established early intervention programs in the west such as the Applied Behavior Analysis model [4] and the Greenspan Floor time model [5] that have been researched and documented to be effective. However these are not only expensive but are generally not accessible in India and South East Asia due to lack of trained personnel. This paper introduces Communication DEALL (Developmental Eclectic Approach to Language Learning)—an indigenous early intervention program for children with autism that has been developed over the last 9 years and reports the results of a pilot study on its efficacy.

Communication DEALL [6, 7] is an indigenously developed intensive early intervention program for children with neuro-developmental communication disorders such as those with Autism Spectrum Disorders (ASD) Specific Language

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Impairment (SLI), and Developmental Verbal Dyspraxia (DVD); which aims at maximizing their potential through intensive preschool intervention. The intervention is provided by a multidisciplinary team of speech-language pathologists, occupational therapists and developmental educators. The primary goal of the intervention for children with developmental disabilities in the Communication DEALL program has been, to integrate them in regular schools to the extent possible, with adequate preparation in the preschool years. The theoretical framework within which the program has been developed is that ASD is primarily a pervasive developmental disorder, most possibly of neurological causation, that affects many developmental domains. The triad of characteristics seen in these children such as poor communication, social skills and prerequisite learning behavior (PLB) such as eye contact, attention, sitting tolerance and compliance, are seen as being linked to more basic difficulties in sensory motor processing. The intervention program addresses the needs of each child by enabling the child to stabilize prerequisite learning behavior, as well as acquire age appropriate developmental skills across several domains, with specialized input from a multidisciplinary team of interventionists. The program provides intervention for 3 h a day, 5 days a week over a period of 10 months from June every year to April of the subsequent year, with two short vacations in October and December. Unlike the better known western early intervention programs [4, 5] which provide intervention based on behavioral and psychological models, it specifically targets developmental issues in the areas of motor, communication, cognitive, social and emotional skills, while incidentally addressing the behavioral issues. Initiated in 2000, the program is increasingly showing positive results. However, in order to make it more widely acceptable and replicated more extensively, to meet the needs of an ever increasing number of children diagnosed with ASD, it is necessary to scientifically document its efficacy.

## Material and Methods

The subjects of this study were 30 children including 21 boys and nine girls, in the age range of 2.2 years to 5.5 years, who were admitted to the Communication—DEALL program at Bangalore, during the year 2007–08. The criteria for inclusion were that they have received a diagnosis of ASD and/or a related condition from a recognized institution and be enrolled in the Communication DEALL program at Bangalore, as of July 2007.

Inclusion Criteria was as follows:

- a) Diagnosis of ASD
- b) In the age range of 2 years to 6 years

- c) Enrolment in the Communication DEALL program at Bangalore, by July 2007

Exclusion Criteria:

- a) Children with global developmental delay.

Informed consent was obtained from the parents for conducting the study.

Diagnostic Sources

The subjects, most of who were initially assessed and diagnosed by child psychiatrists, pediatricians, developmental neurologists, psychologists and others, at well established clinics and hospitals from Bangalore and elsewhere, (such as National Institute of Mental Health & Neuro Sciences, St Johns Medical College Hospital, Specialist Clinic, Children's Hospital, Parijma, Wockhardt, and S. R.Chandrasekar Institute of Speech & Hearing (SRCISH); at Bangalore; All India Institute of Speech & Hearing, Mysore and some clinics abroad—USA & Germany); sought admission in the Communication DEALL program for intervention. The 30 subjects ranged in age from 26 months to 65 months. Table 1 given below provides the subject details and the scores obtained by them on the ICD 10 in July 2007.

Of the 30 subjects 24 met ICD criteria for a diagnosis of ASD both in terms of the total scores and the distribution of characteristics. Of the remaining 6, 4 received a total score of 5 as against the required 6, one had a score of 4 and one subject with De Lange syndrome scored 1 on ICDS.

A general case history was taken from the parents of the subjects during the pre-therapy interview, covering details on the demographic data, birth history, medical history and family history. Also included were details on the onset of the problem and the measures taken by the family in seeking help for the diagnosed problem and questions regarding the speech-language skills, social skills and information on behavioral deficits if any. Regression in these skills, if reported, was also noted.

The Communication DEALL Developmental Checklist (CDDC) [8]: This checklist was developed on data from 360 Indian children and can be used for assessing developmental skills in eight important domains, in children below 6 years of age. The skills that the Communication-DEALL checklist evaluates are Gross Motor skills (GM), Fine Motor skills (FM), Activities of Daily Living (ADL), Receptive Language (RL), Expressive Language (EL), Cognitive Skills (CS), Social Skills (SS) and Emotional Skills (ES). The Communication-DEALL checklist was formally administered twice i.e. pre-therapy as well as post-therapy. Further in order to quantify skill

**Table 1** Subject details and scores on ICD10 during pre therapy assessment in July 2007

Sl No	Age in months	Diagnosis (from Ref Agency)	ICD 10 Social (at least 2)	ICD10 Communication (at least 1)	ICD 10 Behavior (at least 1)	ICD 10 Total (at least 6)
1	31	ASD	4	2	3	9 <sup>a</sup>
2	29	Nil	4	2	1	7 <sup>a</sup>
3	27	Autism	3	2	–	5
4	29	Nil	4	3	2	9 <sup>a</sup>
5	36	Autism	3	2	–	5
6	36	Autism	4	3	3	10 <sup>a</sup>
7	36	ASD	3	2	–	5
8	34	ASD	4	2	1	7 <sup>a</sup>
9	36	ASD	1	2	1	4
10	31	Mild autism	4	3	3	10 <sup>a</sup>
11	42	Nil	4	3	3	10 <sup>a</sup>
12	37	ASD	4	3	3	10 <sup>a</sup>
13	37	ASD	4	2	1	7 <sup>a</sup>
14	39	ASD	4	2	2	8 <sup>a</sup>
15	37	ASD	4	2	3	9 <sup>a</sup>
16	38	ASD	3	3	1	7 <sup>a</sup>
17	48	ASD	4	3	3	10 <sup>a</sup>
18	44	ASD	4	3	1	8 <sup>a</sup>
19	45	ASD	4	3	1	8 <sup>a</sup>
20	42	ASD	4	3	1	8 <sup>a</sup>
21	48	De Lange Syndrome	–	1	–	1
22	48	ASD	4	2	2	8 <sup>a</sup>
23	43	PDD	4	3	3	10 <sup>a</sup>
24	44	Williams Syndrome	4	2	3	9 <sup>a</sup>
25	46	Tuberous Sclerosis	4	2	2	8 <sup>a</sup>
26	48	ADHD	–	3	2	5
27	55	ASD	3	3	2	8 <sup>a</sup>
28	50	ASD	4	1	1	6 <sup>a</sup>
29	59	ASD	4	3	4	11 <sup>a</sup>
30	65	ASD	3	3	1	7 <sup>a</sup>

<sup>a</sup>Meets criteria for total score and distribution of scores on ICD 10

development each item was rated on a five point rating scale as follows:

- NR No response (not known)  
 0 Not Acquired  
 1 Acquired but lost  
 2 Acquired but inconsistently present  
 3 Acquired and consistently present, but only in specific situations.  
 4 Acquired and consistently present across all situations

A maximum score of 182 per year indicated normal development.

Childhood Autism Rating Scale (CARS) [9]: In addition to the above measures each child was assessed on the

Childhood Autism Rating Scale independently by a Clinical Psychologist at SRCISH. CARS is a 15 item behavioral rating scale developed to identify children aged 2 years and older with autism. It provides quantifiable ratings based on direct behavior observation.

The two clinicians involved in the pre and post therapy assessments, were not involved in the intervention program at any stage.

A formal one-on-one interview was conducted at the time of admission into the program (July–2007) and after 7 months to 8 months into the program (Feb–March–2008), with the parents of the subjects. The time taken for each interview was 1 h. The pre-therapy interview included a detailed case-history as well as the administration of

the Communication-DEALL checklist, which was rated on a five point scale. At the post-therapy level, the Communication-DEALL Checklist was administered a second time and rated. Additionally parental observations were documented, in response to the question “Has your child made any improvements after being a part of the Communication-DEALL program? If yes, which are the areas in which s/he has shown improvements?”. CARS was also administered in parallel to the DEALL rating of each child, pre and post therapy. Data obtained at the end of the pre and post therapy sessions was tabulated and analyzed to obtain a measure of change across the eight domains and in each individual domain, as well as on CARS. The data obtained on the two independent measures by the two independent assessors was correlated.

## Results

The details of the 30 subjects in terms of the numbers in the subgroups divided on the basis of age and the raw scores obtained by them on the CDDC and the CARS at the pre and post therapy assessments are given in Table 2 below. The number of children in the different subgroups is uneven, since the Communication DEALL program is an early intervention program and most new admissions are of young children. Older children are admitted only as and when vacancies are available in the older group. Consequently, there is only one subject each in the 54–60 month age group and the 60–66 month age group.

## Statistical Analysis

The data was tabulated and analyzed using the SPSS 10 software for windows. The details of statistical analysis and the descriptive analysis are given below. The significance of difference in the scores obtained by the children on the CDDC across the different subgroups is given in Table 2. As a group the subjects showed highly significant changes from the pre therapy scores to the post therapy scores, across all eight developmental domains.

Overall, the subjects of this study have shown significant improvements in all domains, attesting to the efficacy of the Communication DEALL program in enabling children with ASD to develop skills across all eight developmental domains addressed in the program. Not a single child regressed during this period.

The overall gains made by the subjects of the different age groups across all domains, from the pre-therapy to post-therapy evaluations are depicted in Fig. 1. The average gain made by the children in the group was 17.27 months over a period of 7 months to 8 months of intervention, ranging from gains of 11.4 months seen in the youngest age group to that of over 2 years in group V.

## CARS (Pre and Post Therapy Evaluations)

Similarly the mean scores of the subjects on the CARS evaluation done by an independent investigator, was also subjected to a paired samples *t* test. From a pre therapy

**Table 2** Significance of difference in the pre and post therapy evaluations in all eight developmental domains and CARS. T-Test (paired sample statistics)

Skills		Mean	Std. deviation	Difference	T	P																																																																												
Gross motor skills	Pre	58.9333	18.43522	-32.4333	-10.888	.000(HS)																																																																												
	Post	91.3667	16.95732				Fine motor skills	Pre	56.0333	16.05053	-30.9667	13.128	.000(HS)	Post	87.0000	16.81748	Activities of daily living	Pre	49.4000	16.16638	-35.0000	-13.094	.000(HS)	Post	84.4000	18.46824	Receptive language	Pre	32.8000	11.35751	-36.5333	-11.116	.000(HS)	Post	69.3333	18.98336	Expressive language	Pre	25.1000	8.77044	-25.1000	-6.533	.000(HS)	Post	50.2000	24.42497	Cognitive skills	Pre	47.9667	15.40820	-26.0333	-9.221	.000(HS)	Post	74.0000	20.20242	Social skills	Pre	33.7000	12.94324	-40.0667	-9.733	.000(HS)	Post	73.7667	19.80714	Emotional skills	Pre	46.1667	15.60743	-36.6667	-9.726	.000(HS)	Post	82.8333	17.04372	CARS <sup>a</sup>	Pre	18.0167	8.7745	7.75	10.814
Fine motor skills	Pre	56.0333	16.05053	-30.9667	13.128	.000(HS)																																																																												
	Post	87.0000	16.81748				Activities of daily living	Pre	49.4000	16.16638	-35.0000	-13.094	.000(HS)	Post	84.4000	18.46824	Receptive language	Pre	32.8000	11.35751	-36.5333	-11.116	.000(HS)	Post	69.3333	18.98336	Expressive language	Pre	25.1000	8.77044	-25.1000	-6.533	.000(HS)	Post	50.2000	24.42497	Cognitive skills	Pre	47.9667	15.40820	-26.0333	-9.221	.000(HS)	Post	74.0000	20.20242	Social skills	Pre	33.7000	12.94324	-40.0667	-9.733	.000(HS)	Post	73.7667	19.80714	Emotional skills	Pre	46.1667	15.60743	-36.6667	-9.726	.000(HS)	Post	82.8333	17.04372	CARS <sup>a</sup>	Pre	18.0167	8.7745	7.75	10.814	.000(HS)	Post	10.2667	6.9923						
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<sup>a</sup> The CARS scores are for only 29 children as one of the children in the 30–36 month age range did not keep his repeat CARS appointment

mean score of 18.0167 (SD 8.7745) the post therapy mean score had reduced to 10.2667 (SD 6.9923, the significance of the difference being high (0.000). This significant decrease in scores from the pre-test scores to the post-test scores suggests a significant improvement in the overall behavior of the subjects, indicating a considerable reduction in the behavioral signs that are characteristic of autism.

Finally a qualitative analysis of the parental observations on the changes from the pre-therapy evaluation period to the post-therapy evaluation period was carried out. Since the parental interview was a free flowing interview rather than structured, those domains on which they specifically commented were identified and tallied with the results of the quantitative measures. The parents reported maximum changes in the areas of motor and communication skills. Several but not all reported positive changes in social and emotional skills. Many parents emphasized the need for more changes in the prerequisite learning skills of attention/concentration and eye contact.

**Discussion**

The above findings demonstrate an overall improvement in all eight target domains with significant gains in specific skill areas. The results not only indicate a significant improvement, across all the age-groups, in all eight domains, in the entire subject population, but also show significant decreases on the CARS scores. By and large, the parents reported gains in the areas of motor and communication skills and positive changes in social and emotional skills; but desired more changes in the pre requisite learning skills. It is noteworthy that while the qualitative reports

from the families are in agreement with the quantitative measures of progress across the eight developmental domains, concerns remain in the areas of prerequisite learning behaviors such as sitting tolerance, eye contact, attention and concentration. While these behaviors are qualitatively assessed in the program there are no standard measures applied for the same. The results suggest that this profile based early intervention program i.e. the Communication-DEALL program for children with communication disorders, specifically for those with ASD is an effective early intervention program. However it needs further strengthening, particularly in the stabilization of prerequisite learning skills.

Early intensive intervention for children with ASD based on models such as the Applied Behavior Analysis model and the Floor Time model have been reported to produce positive outcomes. However, these are not easily accessible in countries like India due to lack of trained manpower and high costs. The indigenously developed Communication DEALL model is designed to meet the requirements of the socio economic conditions in India and is replicable.

**Conclusions**

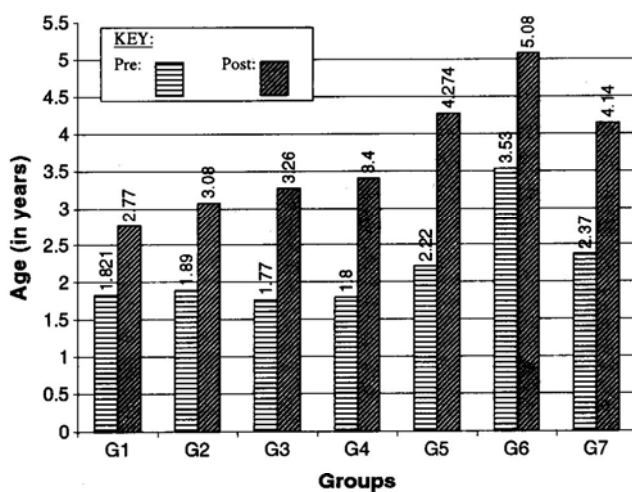
The results substantiate the efficacy of the Communication DEALL program, in that it points to gains in developmental skills along with a significant decrease in behavioral signs. Improvement in overall behaviors, parallel the mastery of the developmental skills. However, the program needs to be further strengthened in the areas of prerequisite learning behavior. The relative efficacy of this program as against the existing models of early intervention for ASD needs to be looked into in controlled studies.

**Acknowledgements** We gratefully acknowledge the contribution of Ms. Alphonsa Joseph, Lecturer, Dept of Psychology, SRCISH, for the CARS assessments of the subjects.

**Contributions** P. K.; Developed and implemented the Communication DEALL program, envisaged the current efficacy study, provided access to subjects enrolled in the program and wrote the paper. S. S.; Carried out the pre and post therapy evaluations and the statistical analysis of the data, as a part of her Master’s dissertation at SRCISH under the guidance of P. K., N. S.; coordinated and facilitated the data collection.

**Conflict of Interests** The Communication DEALL program was developed by the first author.

**Role of Funding Source** In the form of grants, equipment, drugs or all of these; Nil.



**Fig. 1** Overall gains made by the subjects of the different age groups from pre to post therapy assessments

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## ERRATUM

The article entitled “Relapse of Herpes Simplex Encephalitis Presenting as Choreoathetosis” authored by Narendra Rathi and Akanksha Rathi, published in August 2010, Issue, Vol. No. 77(8) page no 901-902, Akanksha Rathi’s affiliation is wrongly mentioned as “Department of Pediatrics, Seth G.S. Medical College and KEM, Hospital, Mumbai, India. Instead of belonging to Department of Pediatrics, she is a M.B.B.S. student studying in Seth G.S. Medical College and KEM Hospital, Mumbai, India.

The error is regretted.

*Editor*