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Research Paper

Effectiveness of Multidisciplinary Team Intervention in Children with Autism Spectrum Disorders: A Pilot Study

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ABSTRACT

Purpose: To analyze clinical outcomes in terms of functional changes in children with Autism Spectrum Disorder (ASD), before and after receiving a Multidisciplinary Team Intervention Programme. Autism spectrum disorder (ASD) is a neurodevelopmental disability and is of public health importance. It affects not only the child but also the family. Methods: Structured multidisciplinary intervention, individualized to each child, was implemented in our child development center in Hyderabad, Telangana, India, in 2021-2022. Secondary data analysis of 38 children diagnosed with ASD, in the age group of 3 - 4 years, was conducted. All children received Behaviour Therapy, Speech Therapy, Occupational therapy, Special Education, Yoga, Group Therapy with Parental counselling, and Home Programme (Programme for the parents to work with the child at home along with the therapist). The average year of intervention was 1 year, sessions comprising 3 hours 45 minutes of Occupational therapy (5 days a week), 3 hours 45 minutes of Speech Therapy (5 days a week), Yoga once a week, Group Therapy once a week and once a week of Parental Counselling. ***Methods:*** Pre and Post-intervention, assessments were done every 3 months, tools used were Denver's Developmental Screening Test (DDST), Vineland Social Maturity Scale (VSMS), and Childhood Autism Rating Scale 3 (CARS 3). ***Results:*** Mean positive difference in CARS total scores through paired t-test was 0.0001 ($p < 0.05$), which was for the first 6 months of intervention and the mean difference between initial and re-evaluation after 6 months. The mean positive difference in CARS total scores through paired t-test was 0.0002 ($p < 0.05$), which was for the ***next*** 6 months of intervention, and the mean difference between re-evaluation 1 and re-evaluation 2 after another 6 months of intervention (total 1 year). Significant positive changes in functional ability were observed in most of the Domains (relating to people; Body use; Adaptation to Change; visual response; Fear of nervousness; non-verbal communication; level and consistency of intellectual response) and

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Paired t-test also showed significant positive changes. ***Conclusions:*** The Effectiveness of the Multidisciplinary Team Intervention approach, and adherence to its protocols have the potential to improve cognitive ability, social skills, Motor skills, and functional academic skills in children with ASD. ***Limitations:*** Results were not validated by tests that need parental reporting (e.g., DDST, CARS, and VSMS). Findings are all on the observations done during and post therapies.

Keywords: *Autism Spectrum Disorders, Multidisciplinary Team Intervention, Telangana, Behaviour Therapy, Speech Therapy, Occupational Therapy, Special Education, Yoga, Group Therapy, Parental Counselling, Home Programme*

Autism is a Neuro-developmental disability characterized by severe social, communicative, and cognitive deficits, resulting in significant lifelong disability. Autism requires long-term treatment, yet, despite the severity of this disorder, some children achieve remarkable long-lasting gains. Over the years, many studies have been published on comprehensive treatment approaches that seek to reduce the general level of impairment in autism (Dawson & Osterling, 1997; Kasari, 2002; Rogers, 1998; Smith, 1999; Wolery & Garfinkle, 2002). The prevalence of autism worldwide, considering the impact of geographic, ethnic, and socioeconomic factors on prevalence estimates. Approximately 1/100 children are diagnosed with autism spectrum disorder around the world. Prevalence estimates increased over time and varied greatly within and across. (Jinan Zeidan, Eric Fombonne Julie Scorah, Alaa Ibrahim, Maureen S Durkin, et al 2022).

There is a lack of evidence-based estimates of the population prevalence of ASD in India. The INCLEN survey reported a prevalence of 1 in 66 children. However, other surveys conducted by non-profit organizations and hospital-based studies reported prevalence rates between 1 in 500 and 1 in 1000 children (Sopan, 2014-15; Raina,2015). The variation in prevalence estimates can be attributed to the difference in measurement methods and indigenous (self-made) assessment tools used in some of these studies. The lack of standardized and reliable estimates of children with ASD, despite the recognized large number of individuals with disabilities, reflects the under-emphasized burden of Autism.

Researchers posit that providing multi-disciplinary, comprehensive intervention across linked areas (behavior, social, communication, regulation) early in development can have a significant positive impact on later cognitive and academic functioning (Shonkoff & Phillips, 2000). For children with ASD, researchers recommend interventions that include parent education, start as early as possible, and blend both behavioral and developmental strategies to address core issues such as engagement and joint attention while systematically improving specific communication and cognitive skills (Wallace & Rogers, 2010). Several controlled, single-subject, and quasi-experimental studies (Ingersoll & Dvortcsak, 2006; Ingersoll, Dvortcsak, Whalen, & Sikora, 2005; Stahmer, Akshoomoff, & Cunningham, 2011; Stahmer & Ingersoll, 2004) and recent randomized trials (Dawson et al., 2010; Yoder & Stone, 2006), have shown that systematic blending of established behavioral and developmental methods accelerates developmental progress. Based on the evidence, researchers recommend a blended developmental and behavioral method as a state-of-the-art treatment for serving children at risk for ASD (Dawson et al., 2010; Stahmer, Schreibman, & Cunningham, 2011).

The public health burden of Autism is compounded by low awareness and acceptance of the condition among caregivers, leading to delayed care-seeking. Moreover, effective

interventions with a multidisciplinary approach are limited. The prevalent understanding among caregivers and the community at large is that ASD 'cannot be cured'. It is known to clinicians and researchers that 'lack of cure' does not imply 'lack of improved functional ability on receiving intervention'. However, most parents in India do not know this, thereby contributing to their generally less positive attitudes towards ASD and its treatment, and perpetuating stigma.

Most studies on ASD in India have been local and have focused on the clinical profiles of children (Kalra, 2005; Juneja, 2010; Kishore, 2011). Few researchers have studied the effect of interventions on the functional abilities of children, and evidence on multidisciplinary interventions is scarce. The impact of multidisciplinary intervention needs to be adequately studied and consistently communicated, not only to the academic and medical community but also to caregivers of children with ASD. This is necessary to combat widespread pre-conceived notions like ‘no treatment', 'long term treatment', and 'no cure’ for ASD, given the socio-cultural environment in developing countries like India. (Samir H Dalwai, Deepti Kanade Modak, Ameya P Bondre, Sajeda Ansari et al 2017)

METHOD

The study was conducted in Blooming Buds Child Development Center located in Hyderabad, Telangana, India. The Center has been active for 3 plus years i.e. from June 2019 till date and has been catering services such as Behaviour Therapy, Speech and Language Therapy, Occupational Therapy, and Special Education along with Yoga and Social Skills Group Therapy to children diagnosed with ASD, LD, Down's Syndrome, and ADHD. The Therapists are all professionals bearing Rehabilitation Council of India Registration (RCI).

Procedure

Data for this study was obtained from 12 children who have been receiving all the therapies mentioned above regularly for more than 1 year from 2021 to 2022. Each child would attend sessions for 3 hours for 5 days (Monday to Friday) and receive Behaviour Therapy, Speech and Language Therapy, Occupational Therapy, and Special Education for 45 minutes each every day, and Yoga and Social Skills Group Therapy once a week on Saturdays for 2 hours.

All the 12 children are between the age group 3 to 6 years comprising 2 girls and 10 boys. Each child receives individual assessment using the tools DDST 2, VSMS, and CARS before receiving the therapies, also by the specific discipline professionals such as Speech and Language therapists, Occupational therapists, and Special Educators. Analysis of the child's strengths and challenges was done and goals were formulated for an intervention program by all four professionals (Behaviour Therapist, Speech Therapist, Occupational Therapist, and Special Educator) that is executed for a defined period (e.g., 1 month). Each child is re-evaluated after the completion of 6 months of intervention, to assess the progress and also to check whether therapeutic goals have been attained and a revised intervention program is then developed, after discussion. During the process of intervention parents, family members, and caregivers are also counselled every week to maximize impact. Thus, each child receives a complete, tailor-made, and customized plan and outcome-oriented intervention for his/her developmental concerns. On average, At Blooming Buds we are currently serving more than 25 children with special needs on a daily basis and this study sample of 12 children has been receiving 225 (45 weeks excluding Saturday and Sunday and other public holidays) individualized intervention sessions annually per child;

In the present study, all children receive four components of individualized therapies: Behaviour Therapy, Speech and Language therapy, Occupational therapy, and Special Education on an everyday basis along with Yoga and Social skills Group Therapy and parental counselling once a week. Intervention sessions were standardized for 45 minutes with a therapist-child ratio of 1:1. The number of intervention sessions received by children during the process is at least 1 year, were 225 sessions of Behaviour Therapy (5 days a week), 225 sessions of Speech and Language Therapy (5 days a week), 225 sessions of Occupational Therapy (5 days a week) and 225 sessions of Special Education (5 days a week) with 4 parental counselling sessions (once a month). Importance of parental Counselling is to check the overall effectiveness of the home program which the parents have been following or practicing will be discussed subsequently, at the end of the month.

Ethical Clearance

Written informed consent was obtained from all caregivers as part of a regular clinical protocol.

Inclusion Criteria

- Children between the ages of 3 to 6
- Children who had completed their 1 year of intervention anytime from January 2021 to 2022 December.
- The first re-evaluation was done after 6 months of intervention and the second re-evaluation was done after 1 year of Intervention.

Exclusion Criteria

- Children below 3 years and above 6 years and with any other comorbid conditions or any other severe medical conditions or hearing / visual disability.

Tools

1. Socio-demographic data sheet: A socio-demographic data sheet was developed and employed in the current study to collect information on relevant variables such as age, gender, religion, domicile, duration of diagnosis, etc.

2. Denver's Developmental Screening Test 2(DDST 2)

This tool tests in the following areas in children between 1 month and 5 years of age. Gross and Fine Motor Development, Language Skills, and Personal-Social Skills. Although not diagnostic by itself, this test is frequently used to identify children who have global problems or problems in one specific area. This test can also be used to track children over time.

The DDST is a skills test that was revised in 1990 as the Denver II to include 125 items. These easily administered items were picked to prevent any bias against gender, ethnicity, maternal education, or place of residence. Most skills are objectively visualized by the tester, but caregiver verbal reports are adequate to pass some of them.

3. Vineland Social Maturity Scale: **(VSMS)** (Doll, E. A. 1953) scale was developed in 1935, at a Training school, in Vineland, New Jersey, USA. Its usefulness is proven in assisting with child guidance and training by indicating the relative aspects of social competence. All domains were used such as Self Help General, Self Help Dressing, Self Help Eating, Occupation, communication, Locomotion, Self-Direction, and Socialization.

4. On CARS 3

The Childhood Autism Rating Scale (CARS) is an observation instrument and was developed to identify children with autism compared to children with other developmental disabilities and determine symptom severity The CARS was developed for children over the age of two years.

Details of these assessments have been provided.

1. With a Developmental Quotient of 70 and above on DDST 2
2. With a Social Quotient of 70 and above on VSMS
3. Children with a total score of 27.5 to 37, falling in the category of Mildly to Moderate Autistic (on CARS)

The above-category children were hypothesized to respond to intervention for at least 1 year.

Quantitative Analysis

Data analysis pertaining to 12 children identified with ASD was conducted, using MS-Excel 2021. The sample included 2 girls and 10 boys.

Denver's Developmental Screening Test 2, Vineland Social Maturity Scale, and Childhood Autism Rating Scale (CARS) (VSMS) were used for the assessment of functional outcomes, before and after Intervention (Doll, 1953; Schopler, 1980). Statistical tests of significance (paired t-tests for calculating differences in means) were used. To perform these statistical tests, the normality of the distribution of Developmental Quotients, Social Quotients, and CARS total scores was assessed, at the initial evaluation and re-evaluation every 6 months for 1 year. However, it is to be noted that in the case of DDST 2, VSMS, developmental ages, and social ages were used for analysis to evaluate pre- and post-intervention effects, as developmental quotient and social quotient are influenced by increasing chronological age. Information was obtained on parents' education and the changes made in the home environment. These background variables were hypothesized to influence the effect of intervention on clinical outcomes.

Home Program

A change in the **home setting** during the intervention period was defined as the Parent's involvement in practicing all that is given in the home program as part of intervention which includes, the responsibility of both parents in teaching the child and following the given program on regular basis and updating the therapists intermittently.

RESULTS

Results were calculated by comparing the scores of DDST & CARS3 between pre- and post-assessment.

Table 1- Socio-Demographic Data

Age	3-6	Number
Sex	Male Female	10 02
Socio-Economic Status	Higher	12
Religion	Hindu Islam	09 03
Family Type	Nuclear Joint	8 5

Habitat	Urban	12
Family Income	Above 50,000 pm	12
Parental Education	Post Graduation	12

Table 1 shows the Socio-Demographic data of children such as age range, gender, Socio-Economic status, religion, family type, habitat, family income, parental education, and number of participants.

Following Tables (2-5) and Figures (1-4) shows the Pre- and Post- Intervention DA (Developmental ages) of children in each domain of DDST.

Table 2- Gross Motor

Names	**Gross Motor Developmental Age (in months)**	
	Pre-Intervention	**Post-Intervention**
Rudraksh	13.5	55.5
Reyansh Reddy	15	55.5
Agasthya	13.5	47
Ketan	23	61
Omar	16.5	40
Sidrah	15	47
Harshith	15	47
Alizah	13.5	55.5
Govinda	35	47
Mahera	28.5	28.5
Pratham	28.5	47
Ishaan	6	20

Table 2 shows the DA (Developmental ages) of children in the Gross motor area of DDST. It represents the results of Pre- and Post-Multi-disciplinary Intervention of 1 year. There was a major improvement in the Gross Motor developmental ages of each child after 1 year of a multi-disciplinary intervention program.

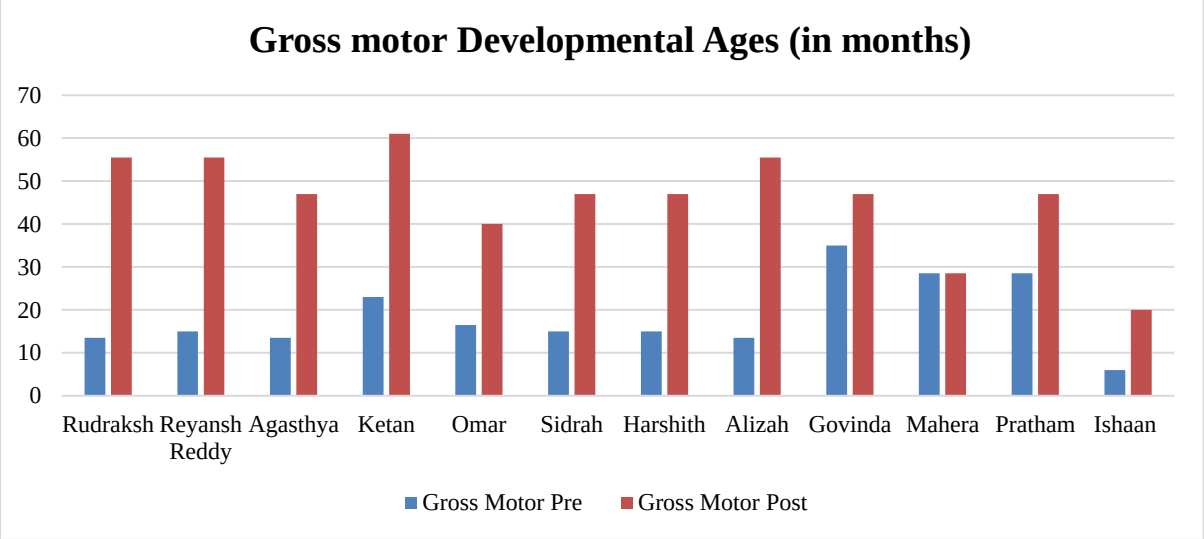

Figure 1. shows the developmental ages of each child in the area of Gross Motor at Pre- and Post- Multi-disciplinary Intervention Programs.

Table 3- Language

Names	Language Developmental Ages (in months)	
	Pre- Intervention	Post- Intervention
Rudraksh	21.5	68
Reyansh Reddy	6.5	50
Agasthya	18	64
Ketan	31	51
Omar	13.5	13.5
Sidrah	7.5	35
Harshith	15	31
Alizah	16.5	35
Govinda	12	51
Mahera	7.5	21.5
Pratham	51	57
Ishaan	7.5	21.5

Table 3 shows the DA (Developmental ages) of children in the Language area of DDST. It represents the results of Pre- and Post-Multi-disciplinary Intervention of 1 year. There was a major improvement in the Language developmental ages of each child after 1 year of a multi-disciplinary intervention program.

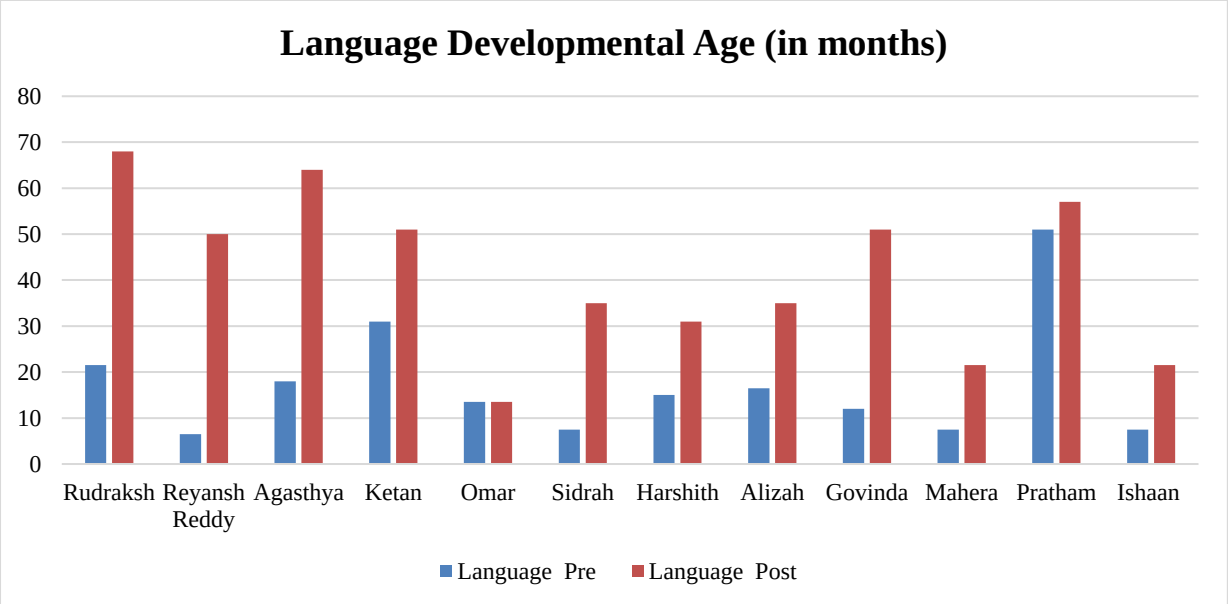

Figure 2. shows the developmental ages of each child in the area of Language in the Pre- and Post- Multi-disciplinary Intervention Program.

Table 4- Fine Motor

Names	Fine Motor Developmental Age (in months)	
	Pre- Intervention	Post- Intervention
Rudraksh	7.5	65.5
Reyansh Reddy	9.5	48
Agasthya	7.5	48
Ketan	39	65.5
Omar	11	39
Sidrah	20.5	48

Harshith	11	39
Alizah	13	41.5
Govinda	31.5	48
Mahera	11	20.5
Pratham	31.5	43.5
Ishaan	5.5	13.5

Table 4 shows the DA (Developmental ages) of children in the Fine Motor area of DDST. It represents the results of Pre- and Post-Multi-disciplinary Intervention of 1 year. There was a major improvement in the Fine Motor developmental ages of each child after 1 year of a multi-disciplinary intervention program.

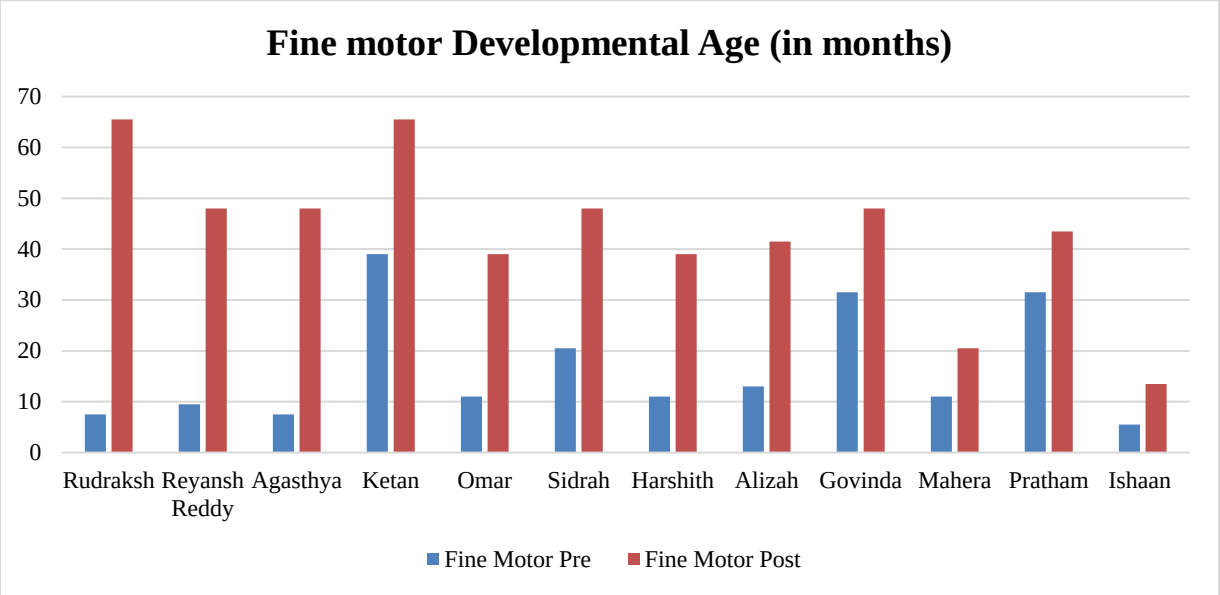

Figure 3. Shows the graphical representation of the developmental ages of each child in the area of Fine Motor at Pre- and Post- Multi-disciplinary Intervention Programs.

Table 5- Personal Social

Names	**Personal Social Developmental Age (in months)**	
	Pre- Intervention	**Post- Intervention**
Rudraksh	5.5	60
Reyansh Reddy	5.5	37
Agasthya	15.5	53
Ketan	20	53
Omar	20	20
Sidrah	6.5	36.5
Harshith	11.5	37
Alizah	11.5	36.5
Govinda	15.5	37
Mahera	14	24
Pratham	30	37
Ishaan	1	5.5

Table 5 shows the DA (Developmental ages) of children in the Personal Social area of DDST. It represents the results of Pre- and Post-Multi-disciplinary Intervention of 1 year.

There was a major improvement in the Personal Social developmental ages of each child after 1 year of a multi-disciplinary intervention program.

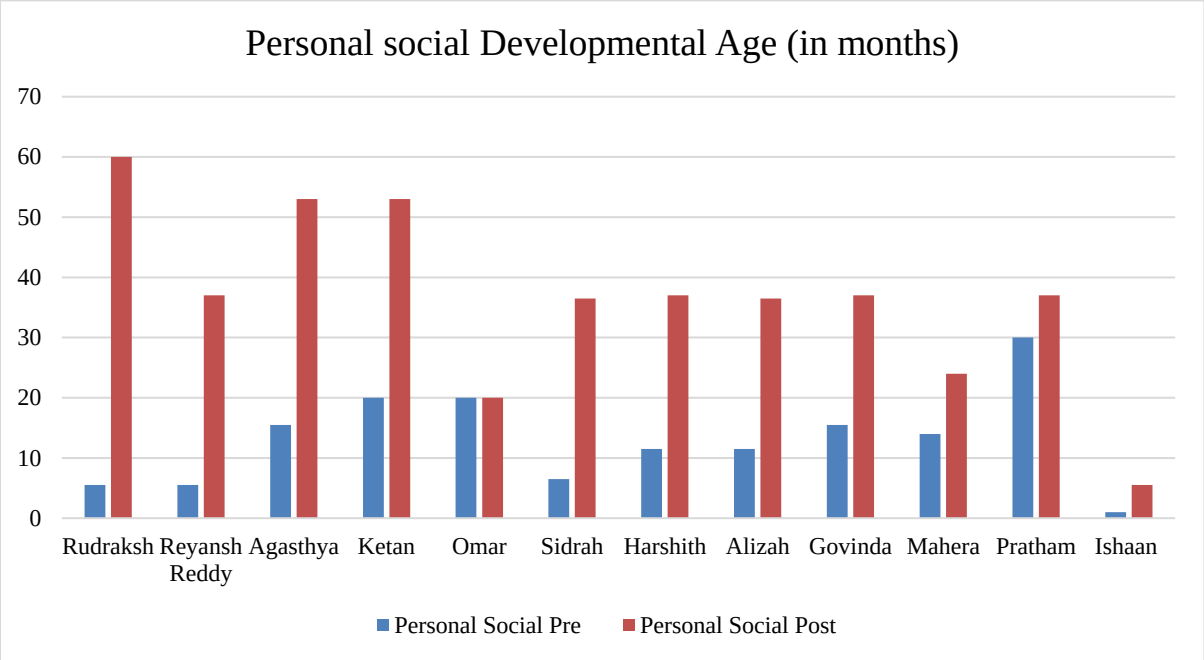

Figure 4. shows the developmental ages of each child in the area of Personal Social at Pre- and Post- Multi-disciplinary Intervention Programs.

Following Table (6-9) and Figures (5-6) shows the scores of CARS 3 at the Initial Assessment and Re-evaluation after 6 months.

Table 6- CARS 3 between Initial Assessment and Re-evaluation 1.

Domains	**Initial Assessment**	**Re-Evaluation 1**
Relating to People	30	23
Imitations	33.5	24.5
Emotional Response	39	27.5
Body Use	29.5	22
Object Use	33.5	25
Adaptation to Change	19	18.5
Visual Response	28	22
Listening Response	32	23.5
Taste, Smell & Touch Response	29	22
Fear of Nervousness	19	19
Verbal Communication	33	25
Non-Verbal Communication	26.5	21.5
Activity Level	32.5	24.5
Level of Consistency & Intellectual Response	24	20

Table 6 demonstrates scores CARS 3 at Initial Assessment and Re-Evaluation after 6 months. Positive differences in CARS scores (total and sub-scale scores) between initial evaluation and re-evaluation 1 (i.e., score at initial evaluation minus score at re-evaluation after 6 months) were noted. Since higher scores indicate greater degrees of developmental difficulty. The scores are gradually decreased showing impeccable or maximum positive changes in

areas like relating to people, imitation, emotional response, body use, object use, adaptation to change, visual response, listening response, taste, smell & touch response, fear of nervousness, verbal communication, nonverbal communication, activity level, level of consistency & intellectual response. It shows how effective is the intervention given by multidisciplinary.

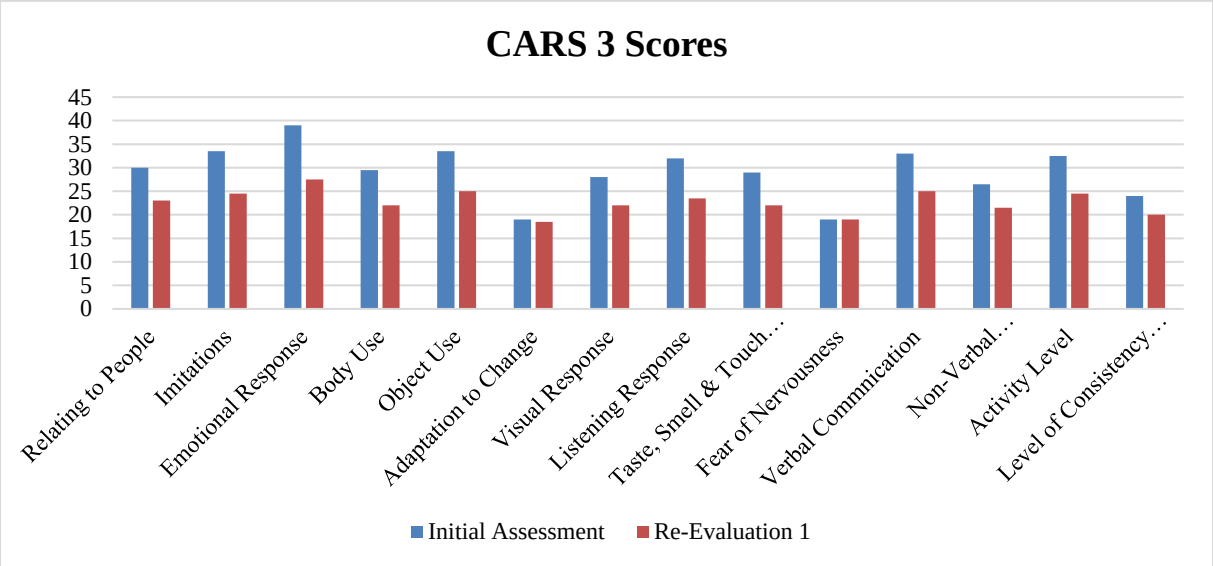

Figure 5 shows the scores of each domain in CARS 3 at Initial Assessment and Re-evaluation 1(after 6 months).

Table 7- Mean difference between the two Assessments on CARS 3 and its significance

N=12	Initial Assessment	Re-evaluation 1 (After 6 months of Intervention)	p-value
CARS 3	408.5	318	0.000282686*

**Significant at 0.05*

Table 7 shows the p-value for CARS 3 and indicates that there is a significant difference between the scores of cars3 at Initial and Re-evaluation after 6 months of intervention.

Table 8- CARS 3 scores between Re-evaluation 1 and 2.

Domains	Re-Evaluation 1	Re-Evaluation 2
Relating to People	23	18.5
Imitations	24.5	18
Emotional Response	27.5	27
Body Use	22	15.5
Object Use	25	21.5
Adaptation to Change	18.5	14.5
Visual Response	22	18.5
Listening Response	23.5	16
Taste, Smell & Touch Response	22	17.5
Fear of Nervousness	19	15
Verbal Communication	25	18
Non-Verbal Communication	21.5	16.5
Activity Level	24.5	19.5
Level of Consistency & Intellectual Response	20	16.5

Table 8, demonstrates scores CARS 3 at Re-Evaluation 1 and Re-evaluation 2. The above table shows the results of the re-evaluation done after six months. As we can see there is a gradual decrease in CARS score during re-evaluation 2. This indicates that there is a positive outcome in various areas of CARS in re-evaluation 2 which is done after a year.

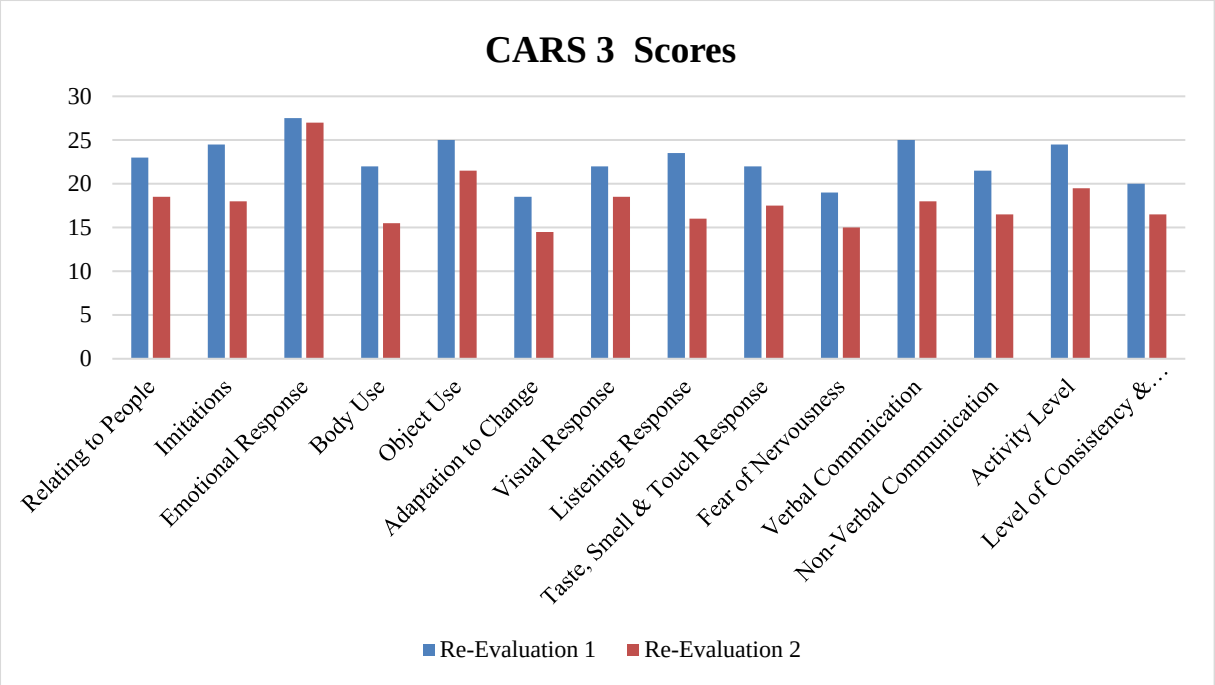

Figure 6 shows the scores of each domain in CARS 3 at Re-evaluation 1(after 6 months) and Re-evaluation 2(after 1 year).

Table 9 - Mean difference between the assessments and their significance

N=12	Re-Evaluation (after 6 months of Intervention)	Re-evaluation (after 1 year of Intervention)	p-value
CARS 3	318	252.25	0.000155864*

Table 9 shows the p-value for CARS 3 and it indicates that there is a significant difference between the scores of CARS 3 at Re-evaluation after 6 months and Re-evaluation after 1 year of intervention.

DISCUSSION

Outcome data from this study adds to the growing body of research into intervention by a multidisciplinary team for children with autism conducted in a child development center. Promising results were obtained in the areas of gross motor, language, fine motor, and personal-social measures. The results were measured with different assessment tools like DDST, and CARS.

The present study results showed that there was a major improvement in developmental ages of language, gross & fine motor, and personal social skills in children who have undergone multidisciplinary intervention programs (Behavioral therapy, occupational therapy, speech therapy, and special education) and immense development in the areas relating to people, imitation, emotional response, body use, object use, adaptation to change, visual response,

listening response, taste, smell & touch response, fear of nervousness, verbal communication, nonverbal communication, activity level, level of consistency & intellectual response as present in CARS. This positive outcome in the samples can be seen after the intervention by a multidisciplinary team as in other studies and these results were correlated with the results of Samir et al. (2017), in terms of the multidisciplinary intervention program and its protocols have the potential to improve functioning in children with ASD.

Limitations

- In the study, the VSMS tool has not been used as the children attending group therapy was irregular.
- One of the samples has taken intervention for a shorter period but then gained remarkable changes in the areas of communication, social, personal…etc areas.
- There is no control group of children receiving non-multidisciplinary teams such as intervention by only an Occupational therapist, Speech Therapist, etc.

CONCLUSION

The study demonstrates that intervention given by a multidisciplinary team is effective for children with autism spectrum disorder. A multidisciplinary team approach enhances overall development in children with ASD. As parents are unaware of this concept, that it's a holistic approach and all required therapies are mandated, they seek 1 or 2 therapies especially Speech Therapy and Occupational Therapy or Behaviour Therapy, and ignore the rest. Because of this, their child's progress becomes slow and they end up investing more time and money due to a lack of counselling.

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Prevalence of autism spectrum disorder in Indian children: A systematic review and meta-analysis

Samir H Dalwai1, Deepti Kanade Modak1, Ameya P Bondre1*, Sajeda Ansari1, Dania Siddiqui1, Diksha Gajria1, Effect of Multidisciplinary Intervention on Clinical Outcomes of Children with Autism Spectrum Disorder in Mumbai, India-2017

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Conflict of Interest

The author(s) declared no conflict of interest.

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