

Comparative Analysis of Cognition and Language in Autism, Mental Retardation and Co- Morbid Autism with Mental Retardation

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Rec date: Sep 30, 2015; Acc date: Oct 22, 2015; Pub date: Oct 29, 2015

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Abstract

Aims: The aim of this study was to correlate the IQ of the language impaired children in autism and mental retardation with their level of development and to understand its effect on the potential to learn language in high functioning autistic, low functioning autistic and mentally retarded children.

Method: The study sample was divided into three groups, notably mental retardation without autism, autism without mental retardation and autism with mental retardation. A total number of 15 subjects were recruited from each group. To maintain the consistency of the IQ mild to moderate range of MR was selected. The tools used for assessment were the Communication DEALL (Development Eclectic Approach to Language Learning), 3D LAT (Language Acquisition Test), and CARS (The Childhood Autism Rating Scale). CARS was used to determine the diagnosis and severity of autism. The expressive and receptive language including the cognition of the children, assessed by 3D LAT was compared with the scores given by the Communication DEALL in the same areas.

Result: The high functioning autistic showed a more significant improvement in all the parameters than the low functioning autistic and the mentally retarded children

Conclusion: I.Q. may act as a limiting factor for low functioning autistic but high functioning autistic have problems due to specific deficits like language and perceptions. Emphasis should be placed on training of Activities of Daily Living (ADL).

Keywords: Autism; Mental retardation; COM DEALL; 3D LAT; Intellectual functioning

Introduction

The relationship between language and cognition has always been a topic of major interest to speech language pathologists. Based on Piagetian theory it is proposed that certain non-verbal cognitive skills are pre requisites for the development of language, in such a case language should not develop in children who lack these skills [1].

Hans Asperger [2] introduced the modern sense of autism in 1938. Autism is a brain development disorder that impairs social interaction and communication and causes restricted and repetitive behavior, all starting before a child is three years old. Autism has been found to have a strong genetic basis [2]. In rare cases, autism is strongly associated with agents that cause birth defects [3]. Autism affects many parts of the brain; how this occurs is poorly understood. Parents usually notice signs in the first two years of their child's life. According to the Utah Frith model [4] in autism because of the biological cause, a neurotransmitter problem is evident that affects the sensory processing and results in three main consequences-(i) cognitive deficit; (ii) behavior problem; and (iii) problem in expressive and receptive language during communication. The most popular explanation for the deficits in autism is understood by the 'theory of mind' which

means being able to understand the entire range of mental functions e.g. beliefs, wants, expressions, feelings, imagination etc. that result in behavior and action. In brief, having a theory of mind means, that the individual has empathy and is able to understand himself. Difficulty in empathy and reciprocity is the core cognitive feature of autism conditions. This cognitive deficit seems to be prevalent among such individuals [1]. In this regard IQ (intelligence quotient) of an autistic child may vary up to any degree but an individual with IQ in the normal or above average range is said to be high functioning autistic contrary to those with IQ below 70, who are called the low functioning autistics. Here an understanding of IQ is important; IQ is a global measure of a person's overall intelligence. IQ below 70 shows that the person is functioning at the retarded level and the grading of the IQ shows the degree of retardation viz. mild, moderate and severe retardation. Early behavioral or cognitive intervention can help children gain self-care, social, and communication skills [5,6]. Since there is no known cure, few children with autism live independently after reaching adulthood. However; some individuals become independent, with some seeking a cure and training. There is nevertheless a belief that autism is a condition rather than a disorder [7].

About a third to a half of individuals with autism do not develop enough natural speech to meet their daily communication needs [8]. Differences in communication may be present from the first year of

life, and may include delayed onset of babbling, unusual gestures, diminished responsiveness, and the desynchronization of vocal patterns with the caregiver [9]. In the second and third years, autistic children have less frequent and less diverse babbling, consonants, words, and word combinations; their gestures are less often integrated with words [9,10]. Autistic children are less likely to make requests or share experiences, and are more likely to simply repeat others' words (echolalia) or reverse pronouns. Joint attention seems to be necessary for functional speech, and deficits in joint attention seem to distinguish infants with autism spectrum disorder (ASD), for example, they may look at a pointing hand instead of the pointed-at object, and they consistently fail to point at objects in order to comment on or share an experience. Autistic children may have difficulty with imaginative play and with developing symbols into language [10]. In some of the studies, high-functioning autistic children aged 8–15 performed equally well, and adults better than individually matched controls at basic language tasks involving vocabulary and spelling. Both autistic groups performed worse than controls at complex language tasks such as figurative language, comprehension and inference [11,12].

Another group which needs intervention is mental retardation (MR). Mental retardation means that someone has lower than average intelligence. The person may have trouble learning and might need longer to learn social skills, such as how to be friends or how to communicate with others depending upon the level of their IQ [13]. When an individual has MR there is even impairment in skills in all areas of development [14]. Hence an MR child of 8 years has a mental age of 5 then all his skills would be roughly around 5 years (i.e. motor, communication, social, self-help, cognition etc.). The WHO grades the mental retardation as per the IQ depending upon the percentile reduction in IQ. The grades are mild, moderate, severe and profound. The increase in the severity of retardation results in the global reduction of all cognitive and behavioral skills [14]. In autism, however; there is an uneven skill development, which is considered a hallmark of autism. In some areas the child may show age-appropriate skills; in some the skills may be below the developmental level; and then again there are people with autism who possess exceptional skills i.e. pockets of intelligence [11].

Language development in high and low functioning autistics can be modified through interventions [15]. There are a number of similarities and dissimilarities among the high and low functioning autistics. Areas of similarities are socialization, narrow interests, communication. And the areas of dissimilarities are the cognition, language deficits, and sensory perceptual deficits [16]. Any developmental language disorder is based upon the theories of normal language development. Language disordered children vary in terms of their language. They also differ in other areas of development as social, cognitive, motor etc. [17]. Theorists have shown that indeed, many individuals with ASD (autism spectrum disorder) do have "a rich array of pragmatic abilities" [18]. Joint attention i.e. the ability to coordinate attention between another person and some object or event in the environment, is an important foundation for language development [19]. Typically the ability to respond to and initiate joint attention bids begins as early as 3-6 months and is well-established by 18 months of age, with refinements up to at least 3 years of age [20]. For the past decade these pragmatic impairments have come to be viewed as intimately linked to deficits in theory of mind, which are considered to be at the core of the disorder [1,5; Happé F [6]; Tager-Flusberg [10]) and research on the relationships between pragmatics and theory of mind in autism has been highly productive. This view of autism has provided an important theoretical perspective on the nature of

language functioning in autism as it is possible to explain the unique and specific pattern of what is relatively spared and what is impaired in this population (Happé [21], Tager-Flusberg, [22]). From a clinical point of view, it is being emphasized that the IQ is often considered as an indicator of an individual's potential to learn language as documented by Cohen [23].

This study focused on the issue of the potential to learn language in high functioning autistics, low functioning autistics and the mentally retarded children. It also emphasized on whether the low IQ in a child causes any marked difference between the development of language and the communication skills in the process of intervention. It also aimed at dealing with the correlation of the IQs of the language impaired children with their developed communication. We also aimed to find out whether a child with low IQ irrespective of the presence of autism, has differences in the developmental pattern and its' effect on the prognosis after therapeutic intervention.

Subject and Method

This longitudinal study was conducted at the Institute of speech, Kolkatta.

Sample The sample was collected from the children who were referred for speech intervention from July 2012 to July 2015. The sample was divided into three groups. Children with autism and an IQ of 70, and symptoms varying from mild to moderate degree on CARS [24], were considered as the high functioning autistics (Group I). Children with mental retardation having mild to moderate degree of retardation i.e. IQ between 70 to 55 and mild to moderate rating on CARS (Group II). Children with autistic features of mild to moderate degree along with mental retardation, with IQ being 70 to 55 and higher rating on CARS i.e. low functioning autistic children (Group III). The IQ was measured by the CDDC (communication DEALL development checklist). Fifteen subjects were taken from each group of disorder. To optimize the sample homogeneity, IQ ranging from mild to moderate was selected. The assessment of the language of the children was done by the Communication DEALL [25], 3D LAT [26], and childhood autism rating scale (CARS) [24]. CARS was used to determine the severity of the autistic features.

The study was approved by the ethical committee of the institute of speech and hearing, Kolkatta

Tools: The Communication DEALL programme is an early assessment cum intervention programme that provides intensive multidisciplinary intervention to small groups of children (usually 12 in number), in the age range of 0-6 years, diagnosed with developmental disabilities. The goal of the programme is to integrate these children into regular schools by school entry age, i.e., 6 years. The Communication DEALL Developmental Checklist (CDDC) was developed by Karanth, to carry out assessments of the children enrolled into the Communication DEALL programme [25,27]. The CDDC is a criterion referenced checklist, to assess developmental skills in 8 domains namely, gross and fine motor skills, activities of daily living, receptive and expressive language skills, and cognitive, social and emotional skills. The assessments are done at 6 month intervals, from 0 – 6 years of age. The questions in each of the 8 domains have been divided into 12 subgroups according to age, i.e., 0-6 months, 6-12 months, etc. For each subgroup, three questions have been delineated to assess skills within that age range. The total number of questions per

domain is 36, and the total number of questions within the checklist, across all 8 domains, is 288. The checklist carries with it a response sheet, which has appropriate space to mark the child's responses to the questions. The administration of the tool takes about 2 to 3 hours. This tool first assesses the IQ, deficits of functioning in various domains listed above by the help of CDDC (which is a part of Com DEALL programme); and thereafter formulates and intervention programme which is tailored to the need of the child. To administer this tool an individual has to undergo training. This tool is used to subsequently train the parents for the long term benefits [25].

The 3D LAT is a test designed by Geeta Herlekar [26], and it is used to evaluate language acquisition along 3 dimensions, namely reception, expression and cognition, in children ranging from (9 months to 3 years). This test uses the informant interview approach and is validated and standardized on children. The test offers a reliable method of assessing the language acquisition in children in a simple manner. The test was designed as part of the doctoral thesis of the author [26].

CARS (Childhood Autism Rating Scale) Childhood Autism Rating Scale (CARS) is a behavior rating scale intended to help diagnose autism [24]. CARS is a diagnostic assessment method that rates children on a scale from one to four for various criteria, ranging from normal to severe, and yields a composite score ranging from non-autistic to mildly autistic, moderately autistic, or severely autistic. The scale is used to observe and subjectively rate the following fifteen items:

relationship to people, imitation, emotional response, body, object use, adaptation to change, visual response, listening response, taste-smell-touch response and use, fear and nervousness, verbal communication, non-verbal communication, activity level, level and consistency of intellectual response and general impressions

This scale can be completed by a clinician or teacher or parent, based on subjective observations of the child's behavior. Each of the fifteen criteria listed above is rated with a score of:

- normal for child's age
- mildly abnormal
- moderately abnormal
- severely abnormal
- Midpoint scores of 1.5, 2.5, and 3.5 are also used

Total CARS scores range from a fifteen to 60, with a minimum score of thirty, serving as the cutoff for a diagnosis of autism on the mild end of the autism spectrum. Children with a score exceeding 36 and who received a rating of three or greater on at least five subscales were categorized as being severely autistic.

Procedure

After determining the data of both language tests separately, the data was correlated i.e. the expressive and receptive language including the cognition of the children, assessed by the 3DLAT was compared with the scores given by the COM DEALL in these specific areas. In addition COM DEALL was used to assess few more areas regarding the communication abilities of the child. On an average an intervention period of 1 ½ years was considered for participants in each group. The data of pre and post therapeutic intervention period was collected. We also correlated the data based on the previous data, parental report, and the view of the therapist dealing with the children, throughout the intervention period.

Statistical Analysis

Statistical tests implemented were the t-test and ANOVA

- 't' test was implemented on the data of both the comparing groups (1- high functioning autism (IQ=70); 2- low functioning autism and mild to moderate mental retardation).

Pre and post intervention data of each disorder was compared individually and among the groups i.e. the group of children with autism was compared with that of the other two disorders (autism, autism with mild mental retardation and only mental retardation without autism, group 3) using the ANOVA. The null hypotheses taken for the study was that there will be no difference among the various groups on the measures of 3DLAT and COMDEALL.

Results

This longitudinal study was a three year study in which we took children having autism and mental retardation and a co morbidity of both. The sample was divided into three groups. Children with autism and an IQ of 70, and symptoms varying from mild to moderate degree on CARS, were considered as the high functioning autistics (Group I). Children with mental retardation having mild to moderate degree of retardation (Group II). Children with autistic features of mild to moderate degree along with mental retardation, with IQ being <70 i.e. low functioning autistic children (Group III). Fifteen subjects were taken from each group of disorder. To optimize the sample homogeneity, IQ ranging from mild to moderate was selected. The results are being depicted in the form of Figures. The differences and the comparison among the disorders, and various groups as stated above are depicted in the section below:

Figure 1 shows the pre and post intervention data of the sample. This showed that there was a significant improvement in the skills like the cognitive ability of the child, the receptive skills and the gross-motor skills of the children with high functioning autism i.e. children with autism having IQ more than 70. Figure 2 shows the pre and post intervention data of the children with low functioning autism i.e. autism with IQ less than 70 (70-35) i.e. with mild to moderate mental retardation. The Figure showed that there was no significant improvement in the various areas apart from the fine motor skills. Figure 3 shows the pre & post intervention data of children (a sample of 15) with only mental retardation without the presence of autism as stated earlier. This group showed approximately same pattern of change as in the case of low functioning autism. On comparing the parameters in the various disorder groups we found that the scores were similar to the ones depicted in the above mentioned groups. Figure 4 represents the comparison between the scores of the autism and autism with MR children. It showed that each group had more or less the same starting level but as seen in the pre intervention data in the Figure there was a significant improvement in the cognitive area, gross motor, and the receptive language of the child. Figure 5 shows the changes in the autism children and the mentally retarded children and it also shows that there were remarkable improvements in the same areas as that of the Figure 4.

The mean age is according to communication DEALL scale, and abbreviations are compared as standard of communication DEALL. The study showed many significant findings based on the intervention of the three groups i.e autism (low & high functioning) and mental retardation. There was a significant difference in the autism and the

autism with mental retardation group, autism being better in its performance on all subscales as is depicted in Figure 6. There was also significant improvement in the high autistic as compared to low autistic and the mentally retarded children.

The implementation of the t test on the first hypothesis that is autism=autism with mental retardation gave that the calculated value of t from the group is more than the t-table value at 1% significance level and degrees of freedom n-1. Similarly the implementation of the same test on the other hypothesis that is autism=mental retardation also gave that the calculated value of t is more than the t value in the table at 1% significance level. Thus the null hypotheses stands rejected in both the cases and showed acceptance of the alternative hypotheses that is post intervention there is a significant improvement in the high functioning autism group and also the mental retardation group.

Discussion

This prospective interventional study was conducted to evaluate the role of the therapeutic intervention in the language and cognitive functioning of low and high functioning autistic children. The mean and standard deviation were calculated. In the lower functioning autistic children there was a mixed sensory picture as far as tactile and vestibular systems were involved, but the trend prior to treatment was that 25% of children showed high percentage of tactile hypersensitivity than hyposensitivity. After treatment a significant change was seen in their arousal similar finding has been reported in other studies [14]. Sensory integration played a vital role in treatment and it is a precursor for cortical learning, which was seen as an improvement in oral praxis, praxis and upper extremity functioning scores in our sample, a similar picture has been reported by [14].

Across all the studies the children with autism perform worse on theory of mind tasks than language [28]. Similar finding can be seen in our study as the children with autism did well on tasks of language, though we did not carry out a 'theory of mind' experiment. This body of research is taken as strong evidence that autistic children have a specific impairment in interpreting human actions in a mental framework [29]. While autistic children do use language to maintain some social contact [15], they can develop and learn by active interventions, and this is aptly seen in the experiment carried out by us. The impairments in children with autism includes a narrow range of functions which are served by the development of language i.e. understanding problems of abstraction of language and the cognitive aspect of language [8]. Although our study did not look at the abstract function of language but we looked at the communication and cognitive aspect and proved that it does change with interventions. Autism is a complex disorder that encompasses multiple areas of impairment [15].

While many of the social and communicative symptoms are seen by us in our study there are many like the emotional and the 'theory of mind' concept which are outside the preview of the paper. In a study on comparing deaf children with children having autism and normal children a direct comparison of the performance of deaf children on a variety of conversational backgrounds was compared with autistic and normal hearing children, it was noted that a critical level of conversational input about mental states is necessary to trigger neurological development on a range of tasks requiring representation of others' mental states [18].

A similar premise is being put forward by us, that an early stimulation can be effective in triggering the development of multiple domains and not only the development of language. In the study done to develop the COM DEALL programme the authors found that the intervention helped in improving communication as well as the cognitive deficits to some extent [27]. Our study is important as it is one of the few studies which has systematically looked at the communication and language in autistic children, mentally retarded children and children having both as co morbidity. The study also validated the efficacy of the indigenously developed COM DEALL and emphasizes the importance of early stimulation in the development of language and cognitive deficits.

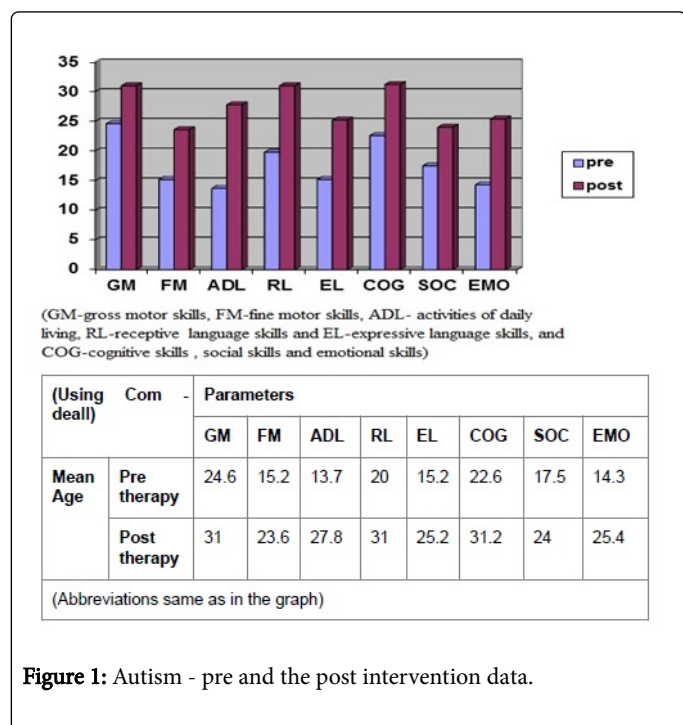


Figure 1: Autism - pre and the post intervention data.

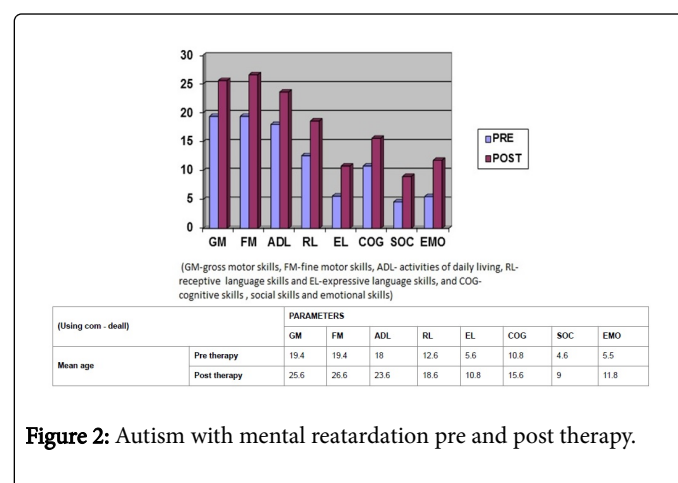


Figure 2: Autism with mental reatardation pre and post therapy.

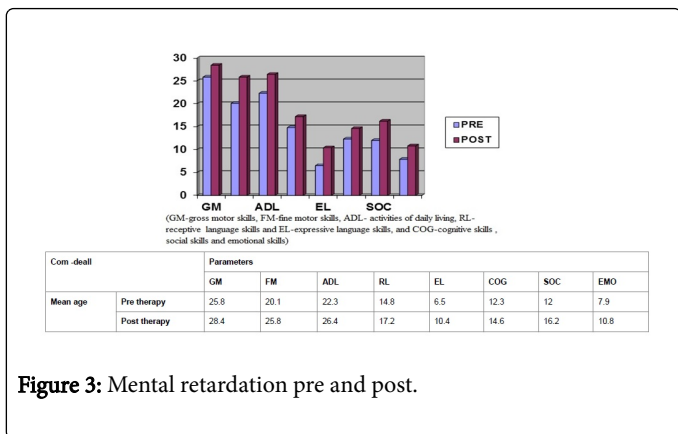


Figure 3: Mental retardation pre and post.

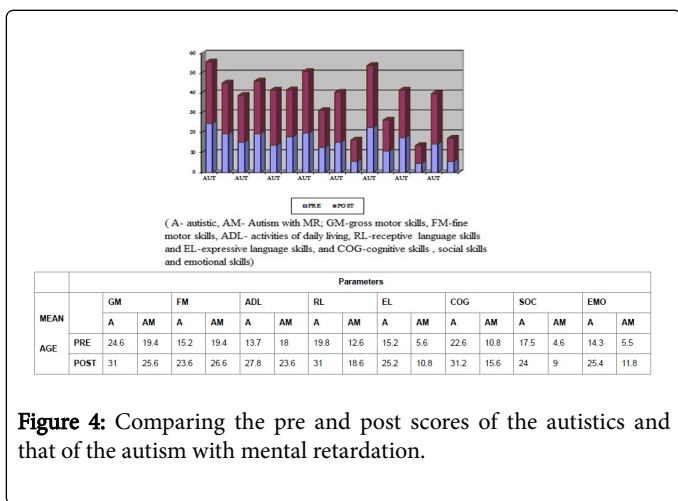


Figure 4: Comparing the pre and post scores of the autistics and that of the autism with mental retardation.

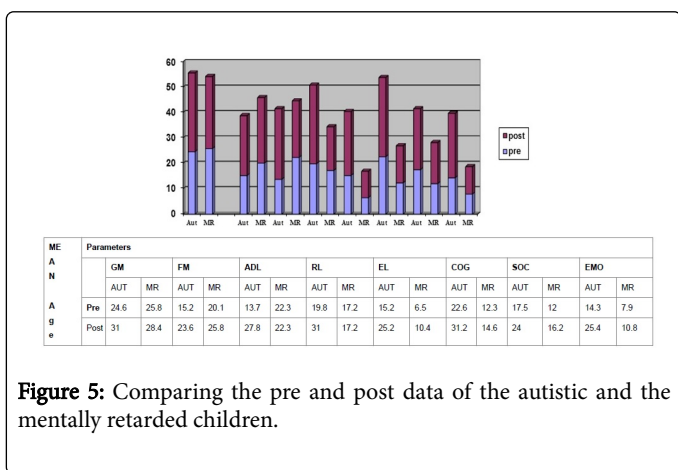


Figure 5: Comparing the pre and post data of the autistic and the mentally retarded children.

The study has some limitation in the form of a smaller sample size and the inability to do a formal correlation with low IQ status of the children. Future studies can take a larger sample and look at the longitudinal aspect of functioning and can do a comparison of the COM DEALL with the internationally established forms of intervention like Lovaas model [30].

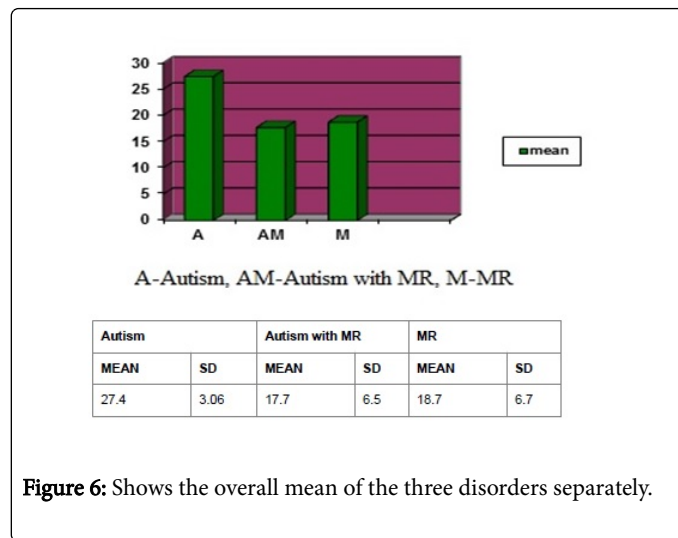


Figure 6: Shows the overall mean of the three disorders separately.

Conclusion

From the above study it may be concluded that, I.Q. may act as a limiting factor for lower functioning children but high functioning children have problems due to specific deficits like language and perceptions. Emphasis should be placed on training of Activities of Daily Living (ADL) in low functioning group so as to make them functionally independent. High functioning children show problems in school performance at a higher age because of deficits in their language and perceptual functioning; hence an early intervention will be helpful to them.

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This article was originally published in a special issue, entitled: "**Cognitive Remediation Programmes for Kids: What Works and why?**", Edited by Zaimuariffudin Shukri Nordin