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Original Research Article

The Role of Demographic Factors in Cognitive Impairments of Children with Autism Spectrum Disorder

S. Gopal Jee

Associate Professor & Head, Department of Psychology, DAV PG College (B. H.U.), Varanasi

ABSTRACT

Autism Spectrum Disorder (ASD) is a clinically heterogeneous condition with a wide range of etiological factors and causing significant public health burden. The present study was designed to assess the cognitive ability and severity of autism spectrum disorder in context of various demographic factors. Twenty five children with autism spectrum disorder (18 mild and 7 moderate) and twenty five normal controls, , aged 4-11 years were selected from Indian Institute of cerebral palsy center, Varanasi. Indian Scale for Assessment of Autism (ISAA) and Child Autism Spectrum Quotient were used for assessment of cognitive ability. Results indicate that there is significant difference among mild, moderate and normal controls on Attention switching, attention detail, imagination and communication skills ($F=101.41$, 21.36, 161.97 and 493.97, $p<0.01$ respectively). The current results also show sex, habitat and SES related differences in the cognitive profile of ASD children. There is significant correlation with demographic variable and cognitive measures in children with Autism spectrum disorder. The study provides evidence that demographic factors influence the cognitive functions in children with ASD.

Key words: Autism, cognition, gender, Region

INTRODUCTION

Autism spectrum disorder (ASD) is a developmental disorder characterised by impaired social interaction and communication, and restricted and repetitive patterns of behaviour and interests (RRBIs) (American Psychiatric Association, 2013). The term "spectrum" refers to the wide range of symptoms, skills and level of impairments that children with ASD can have. These behavioural symptoms are thought to reflect underlying cognitive deficits/differences, which have been extensively researched (Brunsdon & Happe, 2014). It is well established that there is tremendous variability in outcome in autism. Long-term outcome studies have shown that while a majority of individuals exhibit poor to very poor outcomes, many individuals with autism go on to achieve adequate levels of academic, social, and occupational functioning (Nordin & Gillberg, 1998; Sigman & Norman, 1999). In a previous study that followed children with autism from age 2 to 9, as many as 40% were found to have good outcomes based on language and cognitive scores (Stone, Turner, Pozdol, & Smoski, 2003).

ASD occur in approximately 1 to 2% of the population and are more frequently diagnosed in males, with a sex ratio of around 4:1 (Baird et al., 2006; Centers for Disease Control and Prevention, 2014). Considering individuals without an intellectual disability only, the sex ratio increases to 8-9:1 (Mandy et al., 2011; Scott et al., 2002), indicating that sex differences in the vulnerability for autism change as a function of IQ. However, others suggest this discrepancy in autism diagnosis may be overestimated and report overall sex ratios between 2.0 and 2.6:1 (Kim et al., 2011; Mattila et al., 2011). This differential diagnosis has led to an expanding body of

research evaluating sex differences in autism. Understanding sex differences in more detail is important for unpacking the complex aetiology of autism (Rutter et al., 2003). An evaluation of the research to date reveals a number of inconsistencies in the clinical autism phenotype across males and females. some studies have indicated that autistic females display more severe social and communication difficulties compared to autistic males (Hartley and Sikora, 2009), while others have indicated that these difficulties are less severe in autistic women (McLennan et al., 1993), or report no sex differences (Wilson et al., 2016). Some studies suggest that autistic males show more stereotyped and repetitive behaviours than females (Hattier et al., 2011; Van Wijngaarden-Cremers et al., 2014) and that females on the spectrum display more socially acceptable special interests (Gould and Ashton-Smith, 2011). However, others argue that these interests and behaviours are similar across sex (Harrop et al., 2015). It has also been suggested that in order to receive a diagnosis, women are required to display more impairment in functioning than men (Dworzynski et al., 2012), yet other studies fail to confirm these findings when controlling for IQ (Holtmann et al., 2007; Pilowsky et al., 1998).

Geographic variation in the occurrence of ASD has been studied also, and geographical spatial clustering of ASD has recently been observed (Mazumdar et al. 2010, Van Meter et al. 2010). An association between ASD and urbanicity (i.e. higher risk of autism in urban versus rural districts) has been documented (Lauritsen et al. 2005; Williams et al. 2006; Rosenberg et al. 2009; Lai et al. 2012). Urbanicity may act as a proxy for other factors, e.g. better access to diagnostic and medical services or higher exposure to as yet unknown environmental risk factors for ASD in urban vs. rural areas.

Given the inconsistencies in previous research, it is important to study sex and geographical variation in the children with autism. The evidences indicated that children with autism spectrum disorders in India have problems in various spheres of life like social relationships, language & communication problems and cognitive problems. However these areas of research have got least attention from researchers. The diversity of culture and habitat in India may bear on the manifestation of the autism phenotype. Geographical factors have been shown to influence autism prevalence in other countries. Particularly in the case of social communicative deficits toward the autism spectrum, symptoms manifest only against the background of cultural norms and therefore the very existence of some symptoms may be partially a function of culture. In view of the above research gap and controversies, the present study attempts to compare the impact of gender and habitat on social skill, attention switching, attention detail, communication and Imagination among normal, mild and moderate children with Autism spectrum.

Objectives

1. To assess and compare the social skill, attention switching, attention detail, communication and Imagination among normal, mild and moderate children with Autism spectrum.
2. To compare the impact of Gender on the social skill, attention switching, attention detail, Communication and imagination among normal, mild and moderate children with Autism spectrum.
3. To assess the impact of Habitat on social skill, attention switching, attention detail, Communication and imagination among normal, mild and moderate children with Autism spectrum.
4. To explore the relationship between demographic factor (sex & habitat) and different Dimension of AQ.

MATERIALS AND METHODS

Sample

The sample comprised of 25 diagnosed children with autism spectrum disorder (18 mild and 7 moderate) screened

on the basis of Indian Scale for Assessment of Autism (ISAA) and 25 matched controls (Age range 4-11 years) and performed Child Autism Spectrum Quotient. The Autistic children were taken from "Indian Institute of Cerebral Palsy Center Sigara, Varanasi. Children who were suffering from other category of Mental retardation and organic lesion were not included in this study.

Procedure

The participants were approached after taking permission from the respective center and consent from the parents of children. The parents of participant were given full information about the questionnaire and the process of research. The questions of the parents were also handling. In all process confidentiality will be maintained and parents of participant were briefed that the information they will be used only for research purpose.

Tools

1. **Indian Scale for Assessment of Autism (ISAA):** The ISAA is a 40 item scale divided into six domains- Social Relationship and Reciprocity (9 questions); Emotional Responsiveness (5 questions); Speech — Language and Communication (9 questions); Behavior Patterns (7 questions); Sensory Aspects (6 questions) and Cognitive Component (4 questions). The scores for the each item of ISAA range from 1-5 and total score range was 40-200. The lowest score represents no symptoms or symptoms which were present only rarely, and the maximum score indicates the most severe presentation of AD.
2. **Hindi version of the Child Autism Spectrum Quotient:** This is a 50-item parent-report questionnaire developed to detect autistic traits in children 4–11 years of age (Auyeung et al). Higher scores indicate a greater number of autistic traits. The AQ-Child has shown good test–retest reliability, high sensitivity (95%) and high specificity (95%). The AQ-Child was originally designed with five subscales to assess various domains of functioning: social skills; attention to detail; attention switching; communication; and imagination. Each domain is assessed by 10 questions, giving a maximum attainable score of 150.

RESULTS

This study was carried out with the purpose of investigating the role of demographic factors in cognitive impairments of children with Autism spectrum disorder. The collected data was tabulated and was analyzed in the light of objectives framed. To compare the cognitive patterns among normal, mild and moderate children with Autism spectrum, one way ANOVA was applied to test the significance of severity difference in mean scores on these variables, which is displayed in table 1 & table 2, Low score on different domains of AQ is denoting more severity.

Table-1: Mean, SD and One way ANOVA among Normal, mild and moderately autistic children on different dimension of AQ.

Domains AQ	Autism stages	N	Mean	SD	F ratio
Social skill	Mild	18	20.67	5.099	170.668**
	Moderate	7	23.00	2.309	
	Severe	25	3.32	1.909	
Attention switching	Mild	18	17.33	3.614	101.415**
	Moderate	7	21.14	3.532	
	Severe	25	7.12	1.9223	
Attention detail	Mild	18	8.83	4.328	21.362**
	Moderate	7	7.71	3.904	
	Severe	25	16.24	4.166	
communication	Mild	18	23.72	4.012	493.976*
	Moderate	7	26.14	1.215	
	Severe	25	1.52	1.122	
imagination	Mild	18	20.67	4.058	161.975**
	Moderate	7	25.57	2.699	
	Severe	25	6.36	2.413	

** P<.01

An inspection of table-1 indicates that the mean values of the normal children are lower than mildly and moderately autistic children on dimensions of Child Autism Spectrum Quotient. Higher scores indicate a greater number of autistic traits. Results of one way ANOVA, which compared the three groups depending on severity of autism, indicated that there were statistically significant differences between the groups for Social skills ($F_{2,47} = 170.67$, $P<0.01$), Attention switching ($F_{2,47} = 101.41$, $P<0.01$), Attention detail ($F_{2,47} = 21.36$, $P<0.01$), communication ($F_{2,47} = 493.97$, $P<0.01$) and imagination ($F_{2,47} = 161.97$, $P<0.01$). In order to find out the differences in different domains of Autism Quotient by male and female, t test was computed, which is displayed in Table-2

Table- 2: Mean, SD and t values for Autism Quotient across gender

Autism Quotient	Gender	N	Mean	Std. deviation	t value
Social skill	Boys	33	14.82	9.879	2.685**
	Girls	17	7.47	7.543	
Attention switching	Boys	33	14.45	6.638	2.749**
	Girls	17	9.47	4.745	
Attention detail	Boys	33	11.18	5.736	2.156*
	Girls	17	14.71	4.909	
communication	Boys	33	15.88	11.518	2.559**
	Girls	17	7.29	10.646	
imagination	Boys	33	16.24	8.913	2.444*
	Girls	17	10.24	6.666	
Total ASQ	Boys	33	72.58	31.453	2.633**
	Girls	17	49.18	26.085	

* p< .05; ** p< .01

Table-2 represents the result for autism quotient between boys and girls groups. Boys scored high on all domains of AQ than girls (accept attention details) which indicates a greater number of autistic traits in boys. The t values for gender difference on different dimensions of AQ are significant at .01 level, which indicates that boys and girls differ in their social skills, attention switching, attention detail, communication and imagination skills.

Table-3: Mean, SD and t values for Autism Quotient across habitat

Autism Quotient	Habitat	N	Mean	Std. deviation	t value
Social skill	urban	29	6.03	7.144	8.27**
	rural	21	21.00	4.909	
Attention switching	urban	29	8.83	4.759	7.22**
	rural	21	18.19	4.167	
Attention detail	urban	29	14.83	5.278	4.130**
	rural	21	9.00	4.382	
communication	urban	29	5.03	9.018	9.038**
	rural	21	23.90	3.687	
imagination	urban	29	8.90	6.878	7.371**
	rural	21	21.52	4.423	
Total ASQ	urban	29	43.06	23.579	8.951**
	rural	21	93.62	11.561	

** p< .01

Table-3 shows the result for autism quotient between urban and rural groups. Children resided in rural areas scored high on all domains of AQ than resided in urban areas (accept attention details) which indicates a greater number of autistic traits in rural area. The t values for geographical differences on different dimensions of AQ are significant at .01 level, which indicates the higher risk of autism in urbanicity.

Table-4: Correlation coefficient between demographic variables and all dimensions of AQ

Demo variable	Social skill	Attention switching	Attention detail	Communication	Imagination
Gender	-.361**	-.369**	.297*	-.347*	-.355*
Habitat	.767**	.722**	-.512**	.794**	.791**

*p<0.05, **P<0.01

Table -4 reveals the relationship between Gender, Location and domains of AQ. It is evident from the table 3 that the coefficient of correlation between Social skills, attention switching, communication and imagination with gender is negative and significant at .05 level and the coefficient of correlation between Domains of AQ with their habitat is positive and also significant at .01 level.

DISCUSSION

The present study was aimed to find out the differences between children with mild ASD, moderate ASD and normal controls on AQ. This study also aimed to find out any differences with regards to gender and region. The major findings of this study are that mildly and moderately autistic children are unable to communicate and lack of social skills. Children with ASD may have difficulty developing language skills and understanding what others say to them. They also often have difficulty communicating nonverbally, such as through hand gestures, eye contact, and facial expressions. ASD affects people in different ways and can range from mild to severe so moderately autistic children more effected than mildly and normal controls. Autism spectrum disorders (ASD) is characterized by deficits in two core domains: deficits in social communication and social interaction; restricted repetitive patterns of behavior, interests and activities (APA,2013).

It is well established that females are much less likely to be diagnosed with an autism disorder (ASD) than males, with an approximate ratio of 5:1 (e.g., Centers for Disease Control and Prevention, 2012) despite manifesting equivalent levels of autistic traits as assessed by the Childhood Autism Spectrum Test (Dworzynski, Ronald, Bolton & Happé, 2012). Results of the present study reveals that children resided in rural areas are more effected which support the other study (Mazumdar et al. 2010). An association between ASD and urbanicity (i.e. higher risk of autism in urban versus rural districts) has been documented (Lauritsen et al. 2005; Williams et al. 2006; Rosenberg et al. 2009; Lai et al. 2012). Urbanicity may act as a proxy for other factors, e.g. better access to diagnostic and medical services or higher exposure to as yet unknown environmental risk factors for ASD in urban vs. rural areas. Autism spectrum disorder (ASD) diagnoses are made based on a pattern of behavioral symptoms, yet a growing body of research indicates that when, and indeed whether, an individual receives a diagnosis of ASD is influenced by demographic factors including sex, habitat, ethnicity, socioeconomic status (SES), and parental education level.

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