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# Intelligence Quotient of Primary School Pupils with Autism Spectrum Disorders in Uyo, Nigeria

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**Abstract:** Although autism Spectrum Disorders (ASD) have been considered to be associated with intellectual disability, there is no known study on cognitive capacities of primary school aged children with ASD in Nigeria. The objective of this study is to compare the intelligence quotient (IQ) of primary school pupils with autism spectrum disorders with that of their controls in Uyo, Nigeria. Gilliam Autism Rating Scale–second Edition (GARS-2) and Gilliam Asperger Disorder Scale (GADS) were used to identify school children with Autism Spectrum Disorders (ASD). Their intelligence quotient was assessed using the Draw–A–Person–Test (DAPT). The findings were compared with that of their age, social class and gender matched controls. A total of 29 pupils with autism spectrum disorders were identified out of 2,641 studied. Twenty-six out of the 29 children with ASD were suitable for intelligence quotient estimation using DAPT; two of the pupils were less than 4 years of age and one had features suggestive of Down syndrome. Eleven out of 26 pupils (42%) assessed for intelligence quotient had intellectual disability (IQ<75%) while fifteen (58%) had normal intelligence (IQ>75%). The overall mean IQ score of the pupils with ASD of 82.5±22.5 was significantly lower than that of the controls of 108.9±14.8 (p<0.01). Pupils with Asperger’s disorder had the highest mean IQ while those with autistic disorder had the least mean IQ with a statistically significant difference (p<0.01). ASD are associated with low IQ among school children in Uyo, Nigeria.

**Keywords:** Intelligence Quotients, Autism Spectrum Disorders, School Children, Uyo

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## 1. Introduction

Autism is a neuro-developmental disorder that results in impairments in social, communication with stereotyped activities, interest and behavior [1]. Autism Spectrum Disorders was formerly regarded as a spectrum consisting of autistic disorder, Asperger’s disorder and pervasive developmental disorder, not otherwise specified [2]. On the contrary, Diagnostic and Statistical Manual of Mental Disorders, 5<sup>th</sup> edition (DSM-V) rather groups these subtypes into a single classification called ASD; and retains the diagnostic criteria of early onset and variability in presentation (severity) of the condition [1]. It is heterogeneous in nature and one of the primary aspects of heterogeneity lies in the global cognitive functioning or

intelligence.

Several studies have been carried out on the prevalence of ASD using different assessment tools. In a study of children aged 3-10 years with ASD in New Jersey, United States of America; which incorporated administration of Autism Diagnostic Observation Schedule-Generic, demonstrated a prevalence of 0.67%. [3]. A region based study of children with neuro-developmental disorders aged 2-9 years that incorporated an urban and a rural district in Uganda yielded estimated prevalence of 1.2–1.3% for ASD in the population [4]. The “Ten Question” Questionnaire originally designed to assess for neuro-developmental disorders was modified and extended to be able to detect ASD in the study. However, no test for intelligence quotient specifically on the children with ASD was performed [4]. Bakare et al [5] in Enugu, south eastern Nigeria had a prevalence of 11.4% among children in

an interventional center for intellectual disabilities utilizing International Classification of Diseases, Tenth Edition (ICD-10) Diagnostic Criteria for Research.

A significant proportion of children with ASD have been reported to have impaired intelligence [5], [6], [7], [8], [9], [10], [11], [12]. Twenty studies carried out in Asia, Europe and the Americas that incorporated IQ assessment showed intellectual disability in 40-100% of the autistic individuals studied [11]. In a study of children aged 3-10 years with ASD in New Jersey, United States of America, 49% had IQ less than 70 (low functioning); while the remaining 51% were high functioning (IQ above 70) [3].

Interest in elucidating the characteristics of African children with ASD has increased in the last decade but study on their cognitive ability is scanty, and mainly on restricted population of children with neuro-developmental disabilities [13]. A study among 63 Tunisian children with ASD referred to a child Psychiatric clinic had 60.8% with intellectual disabilities (IQ<70) [12].

Intelligence quotient level of preschool and school aged children with Autism Spectrum Disorders (ASD) provides a global measure as well as predictive value for cognitive competence, predicts the expected behavioral deficits and outcome, and also aids in prescription of appropriate rehabilitation strategies for the autistic child [14], [15]. There is no known study on the intelligence quotient of school children with ASD in main stream primary schools in our environment. The study helps to identify the IQ capacities of pupils with ASD and the need or otherwise for special attention.

## 2. Materials and Method

The study was conducted in Uyo, the capital of Akwa-Ibom State in Nigeria over a period of seven months (November 2014 to May 2015). Ethical clearance was obtained from the Institutional health research ethical committee of the University of Uyo teaching hospital, Uyo. Written consent was obtained from the educational board of the state as well as from the parents of the pupils involved in the study. Older children also gave their assent.

The study was conducted among children in the age group of 3-11 years in primary schools in Uyo urban. Uyo urban has 55 primary schools which consist of 15 public schools and 40 private schools. The total population of primary school pupils in Uyo urban was 71,659 in the 2014/2015 academic year. Pupils in public primary schools were 24,672 while those in private schools were 46,987.

Twelve primary schools were randomly selected using the table of random numbers. The schools were alphabetically listed with their actual school enrolment; and the schools were numbered 01 to 55. The starting page on the Table of Random Numbers was randomly picked using ballot method [16]. The starting point on the selected page of the table of random numbers was in turn determined by one of the investigators dropping one finger on the page with the eyes closed to select the column and the corresponding row.

Moving in up-to-down direction (ie in column), the school whose code number corresponded with the last two digits of the random numbers was picked. The procedure was repeated in the column until the twelve primary schools were picked [16]. Any particular number picked already was subsequently ignored when encountered again. The twelve schools picked, comprised of seven private schools and five public schools.

The twelve selected primary schools had a total population of 14,240 pupils, out of which 12,135 belonged to the age group for the study. The seven selected private schools had a total population of 7,423 and of this, 6,287 met the inclusion criteria. The five public primary schools had a total population of 6,817 pupils with 5,848 belonging to the age bracket for the study. A total of 2,641 pupils were recruited into the study and the number of pupils to be sampled from each of the twelve schools was determined proportionately based on the total number of pupils from each particular school that met the inclusion criteria.

GARS-2 was administered by one of the investigators on the 2,641 pupils from the selected schools with their teachers supplying the answers [17]. Children with autism index score of less than 70 were considered not likely to have Autistic Disorder (AD) or any other types of ASD [17] and were excluded from the study. Gilliam Asperger's Disorder Scale [18] was also administered by one of the investigators in addition to GARS-2 on children with autism index of 70 and above. For children with autism index of 70 and above, one of the investigators administered the GARS-2 parents' interview questionnaire on their parents with all the 'key questions' asked. Also, the GADS parent interview questionnaire was administered and the 'key questions' were asked the parents of pupils with GADS Asperger's disorder quotient of 80 and above. All questions in the assessment tools were asked, except for pupils who were non communicative in which case the communication subscale of GARS-2 was omitted [17].

Intelligence quotient of both subjects and control was assessed using the Draw-A-Person Test. This test has been validated and standardized for use in Nigerian children [19]. Also, study has shown that greater accuracy in children's figure drawing is associated genetically with higher intelligence a decade later [20]. The other advantage is that DAPT is a non verbal test and so is a suitable tool for IQ estimation in children with ASD.

When the GARS-2 and/or GADS score and the information on the early development of the assessed pupil based on the parent interview suggested ASD, the Draw-A-Person test (DAPT) was administered to the child to estimate his IQ. For every pupil with ASD, another pupil (control) that was the closest to the former based on the class register and matched for gender, social class and age; and with GARS-2 autism index score of 41 was selected for the DAPT. Both the children with ASD and the controls were given a plain white sheet of paper each and a pencil and instructed to draw a person. They were instructed to make the very best picture they could, taking their time, working very carefully and ensuring to draw the whole human being [21]. They were

given forty-five minutes to carry out the task though they were free to submit their paper at any time provided they did not go beyond forty-five minutes. Scoring of the drawings was done after collating the drawings from the pupils. The scoring system designed by Zigler which had been administered on Nigerian children was used [22], [23], [24]. Pupils with Draw-A-Person Quotient (DAPQ) of less than 75% were classified as low functioning while those with DAPQ of >75% were regarded as high functioning. Parental social classification into the upper (I, II), middle (III) and lower (IV, V) groups was done using the method recommended by Oyedeji [25]. In this method of classification, specific scores were allotted to specific parental occupation and educational qualifications and the means of these scores were used to classify the children to socioeconomic groups I, II, III, IV and V and grouped as above.

The student’s t-test was used to determine the statistical significance of observed differences between means values while frequency distributions were compared in the appropriate contingency tables by means of chi-squared test.  $p < 0.05$  was taken as indicating statistical significance.

### 3. Results

A total of 29 pupils from the selected schools were identified with ASD. Three of the children were excluded from DAPT because two were below the age of 4 years and

one had clinical features suggestive of Down syndrome which is a condition with inherent intellectual disability. For each group (pupils with ASD and their controls), 21 (80.8%) were males while 5 (19.2%) were females giving a male to female ratio of 4.2:1. Equal number of pupils belonged to the age group of 4-5 years and 6-11 years. Majority of the pupils (65.4%) were from the upper social class while 15.4% and 19.2% were from middle and lower social classes respectively. The age, gender and social class distribution of study population is presented in table 1.

**Table 1.** Shows the distribution of the distribution of the study population according to age, gender and socio-economic status.

	N (%)
Age (years)	
4-5	13(50)
6-11	13(50)
Gender	
Male	21(80.8)
Female	5(19.2)
Social class	
Upper	17(65.4)
Middle	4(15.4)
Lower	5(19.2)

Table 2 shows the intelligent levels of pupils with ASD. Pupils with Asperger’s disorder had the highest mean IQ and the least was seen among pupils with Autistic disorder. The difference was statistically significant ( $p < 0.01$ ).

**Table 2.** Shows the intelligent quotient levels of pupils with ASD.

ASD type	Frequency(N)	IQ Mean	Score Range	95% confidence interval	Standard deviation	p-value
PDD-NOS	18	80.8	52.0-118.0	72.5-89.0	16.6	
Autistic disorder	6	70.2	41.0-87.0	51.4-88.9	17.9	<0.01
Asperger’s disorder	2	134.5	132.0-137.0	102.7-166.3	3.5	

Fifteen (57.7%) of the pupils with ASD were high functioning with  $IQ > 75$  while the low functioning accounted for 42.3% of children with ASD. Three of the six pupils with autistic disorder had intellectual disability ( $IQ < 75$ ) while the remaining three were high functioning. Ten of 18 pupils (55.6%) with PDD-NOS were low functioning while the remaining 44.4% were high functioning. All (100%) of the pupils with Asperger’s disorder were high functioning with  $IQ > 120$ .

High functioning pupils were more in the male population relative to the females, though this was not statistically significant ( $p = 0.06$ ). Fourteen of the 21 (66.7%) males with ASD were high functioning while one of the five females with ASD was high functioning. There was no significant

relationship between the age of the children with ASD and their IQ. Eight out of the 13 pupils with ASD (61.5%) in the age range of 4-5 years were high functioning while 38.5% were low functioning. The 6-11 years age group had seven pupils (53.8%) being high functioning and 46.2% were low functioning. Majority of the high functioning as well as low functioning ASD belonged to the upper socio-economic class. Among the high functioning ASD, 11 out of 15 (73.3%) were from the upper social class, 2 (13.3%) from both the middle and lower social classes. Similarly, among the low functioning ASD pupils, 54%, 18.2% and 27.3% belonged to the upper, middle and lower social classes respectively. The relationship of IQ with gender, age and social status of children with ASD is shown in table 3.

**Table 3.** Shows the relationship between the demographic characteristics and IQ level among pupils with ASD.

Demographic characteristic	Intelligent Quotient		Chi square	df	p-value
	High functioning ( $IQ > 75$ )	Low functioning ( $IQ < 75$ )			
Gender(%)	Male	14(66.7)	3.60	1	0.06
	Female	1(20.0)			
Agegroup(%)	4-5 years	8(61.5)	0.16	1	0.69
	6-11 years	7(53.8)			

Demographic characteristic	Intelligent		Chi square	df	p-value
	High functioning (IQ>75)	Quotient Low functioning (IQ<75)			
Socialclass(%)			1.08	2	0.58
	Upper	11(73.3)			
	Middle	2(13.3)			
	Lower	2(13.3)			
		6(54.5)			
		2(18.2)			
		3(27.3)			

Table 4 compares the mean IQ of the children with ASD with their controls. The mean intelligence score of pupils with ASD was  $82.5 \pm 22.5$  while that of the controls was  $108.9 \pm 14.8$ . The mean IQ was significantly lower for pupils with ASD than the controls ( $p < 0.01$ ).

**Table 4.** Comparison of the overall IQ of pupils with ASD and controls.

Type of pupil	Mean IQ	Standard deviation	Confidence interval	p-value
ASD	82.5	22.5	15.9-37.1	<0.01
Controls	108.9	14.8		

## 4. Discussion

This is the only study, to the knowledge of the investigators, in Nigeria on the intellectual ability of primary school children with ASD in mainstream school. More males than females had ASD in this study. This was in consistent with earlier report on gender difference in ASD [8], [26]. More pupils from the upper socio-economic class were found to have ASD. This observation was in keeping with findings from other studies among children with ASD [9], [26], [27]. The upper social class preponderance could be due to the fact that greater number of pupils with ASD are likely to attend private schools where parents feel they have adequate facility to cater for their children with disability while those from lower social class may experience a high drop-out rate. Besides, placement of wards in private school in Uyo urban could be determined by financial prowess and perception of better care [28].

The pattern of IQ level among the three subtypes of ASD in this study demonstrated that pupils with Asperger's disorder had the highest mean IQ score while pupils with autistic disorder had the least mean IQ score. The cognitive functioning in the pupils with Asperger's disorder in this study which showed superior IQ supports the case definition of Asperger's disorder according to American Psychiatry Association's (APA) Diagnostic and Statistical Manual on Mental Disorders, 4<sup>th</sup> edition (DSM-IV) [29].

The pattern of cognitive functioning of the three subtypes of ASD seen in this study was similar to what Chakrabarti and Fombonne observed on comparing the cognitive profile of the three subtypes of ASD [30]. Bertrand et al also demonstrated that children who met criteria for autistic disorder had lower mean IQ score when compared with children with the other subtypes of ASD [3].

The mean IQ score of  $70.2 \pm 17.9$  for pupils with autistic disorder in this study compares well with  $67.2 \pm 18.8$  which was obtained by Bertrand et al though they used Differential Abilities Scale in the assessment for IQ and IQ cut-off of 70 in differentiating high from low functioning ASD.

This study demonstrated that 57.7% of children with ASD had IQ within normal range using the DAPT. This cognitive functioning profile was higher than 51% obtained by Bertrand et al [3] but lower than 75.8% obtained by Chakrabarti and Fombonne [30]. The finding that 100% of the pupils with Asperger's disorder had IQ within the normal range was also observed by other authors [30].

The mean intelligence score of pupils with ASD was  $82.5 \pm 22.5$ . Although this was significantly lower than that of the controls, the mean score showed normal intelligence. Studies assessing the strengths and weaknesses of children with ASD using IQ have been inconsistent [31]. However, analysis of relevant studies by Whitby and Mancil [32] elucidated that their areas of weakness are writing including graphomotor and organizational skills, attention, complex processing, listening and reading comprehension; with the weakest areas being arithmetic and comprehension.

## 5. Conclusion

The intelligence ability of pupils with ASD was significantly lower than that of pupils without ASD. Periodic screening of school children for ASD is advocated and special attention should be paid to those with intellectual disabilities to help them achieve their full potential in life.

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