



Intelligence Quotient of Primary School Children with Attention Deficit Hyperactivity Disorder in Nigeria

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Abstract

Background: ADHD is the most common and persistent neuro-behavioral disorders of childhood, affecting children in both the developed and developing world. Children with Attention deficit hyperactivity disorder (ADHD) have been found to have high intelligence quotients (IQ) in some studies while others have reported a low IQ in association with ADHD. No known studies investigating the relationship between ADHD and IQ were found for Nigeria and there is a paucity of such studies in Sub Saharan Africa.

Objective: To compare intelligent quotient of children with ADHD and children without ADHD.

Methods: The Draw A Person Test (DAPT) was administered to determine the IQ of 146 pupils aged 6 - 12 years recently diagnosed with ADHD using the Vanderbilt Attention Deficit Hyperactivity Disorder (ADHD) Diagnostic Teacher Rating Scale. Pupils were drawn from 12 primary schools in Ikot Ekpene, Nigeria. The DAPT was also administered to 146 age/sex matched controls without ADHD.

Result: The mean IQ score of the pupils with ADHD was significantly lower than that of controls (IQ score of pupils with ADHD = 74.7 ± 29.2 , Controls = 103.5 ± 33.0 , $p = 0.0001$). Fifty-four percent of the pupils with ADHD who had low IQ had the hyperactive subtype of ADHD.

Conclusion: The mean IQ of the pupils with ADHD was significantly lower than that of controls. Policies should be put in place to implement the screening test for ADHD under the school health programme for the early identification of pupils with ADHD.

Keywords: Attention Deficit Hyperactivity Disorder (ADHD); Intelligence Quotients (IQ); Draw A Person Test (DAPT)

Introduction

Attention deficit hyperactivity disorder (ADHD) is one of the most common neuro-behavioural disorders of childhood [1]. It is defined by persistent, pervasive, impairing, and developmentally excessive levels of hyperactivity/impulsivity, and inattention [2,3]. It is one of the most commonly diagnosed behavioural disabilities in the United States classroom settings [4]. ADHD is associated with poor grades, poor reading and mathematics standardized test scores, and increased grade retention [5] and it is also known that

certain aspects of cognitive and adaptive abilities such as executive functioning and adaptive skills are adversely affected in children with ADHD [6-8].

Children with ADHD have difficulty sustaining attention in task and play, get easily distracted and forgetful and can barely stay still and hence have poor academic performance [9,10]. These problems, if unknown can make the children become a problem for themselves, their teachers, parents and siblings [10]. When pupils with ADHD are left unidentified, the cumulative effect of low self-

esteem, chronic school failure and inadequate social skills may lead to adolescent antisocial behavior which includes alcoholism, substance abuse and school dropouts [5,10].

Intellectual disability refers to “a group of disorders that have in common deficits of adaptive and intellectual function and an age of onset before maturity is reached” [11]. For an intellectual disability to be diagnosed, significant impairments in adaptive function in addition to significantly sub-average intellectual function must be established [11].

Children with ADHD may have a broad range of cognitive abilities and it has been reported that children with ADHD tend to have a 9-point lower intelligence quotient score than those without the diagnosis [12]. However, some literature have reported the possibility of having a high IQ with ADHD and some have been termed “gifted” [13]. In a Norwegian study by Skogli, *et al.* [14] involving 80 children with ADHD aged 8 - 17 years and 50 age-matched healthy controls, it was found that although the children with ADHD all had normal full-scale IQ scores when tested with the Weschler Abbreviated Scale of Intelligence, their test scores were still significantly lower ($p = 0.004$) than those of age-matched controls [14]. Busch, *et al.* [15] in a much larger study of 280 American children with ADHD and 242 age-matched controls also found statistically significant differences between children with and without ADHD on measures of intellectual function-full-scale IQ as measured by the Weschler Intelligence Scale for Children-Revised [15].

Kaplan, *et al.* [16] in Canada found that when the vocabulary and block design short forms of the Wechsler Intelligence Scale for Children-Third Edition were administered to 63 children with ADHD, 69 children with reading difficulties (RD) and 68 children with co-morbid ADHD + RD, the distributions of estimated Full Scale IQs (FSIQ) for each of the three groups of children did not differ significantly from a normal distribution, with the majority of children (more than 50%) in each group scoring in the average range [16]. A study comparing working memory in children with ADHD in South Africa and England (52 each) with their “Typically developing” (TD) peers (20 each) found that children with ADHD in South Africa performed worse than their counterparts with ADHD in the UK and both groups of children with ADHD performed worse than their TD counterparts. All the participants of the study were however of normal IQ [17]. Most of the studies on ADHD and IQ are challenged by a small sample size which affects the generalizabil-

ity of the study. Also, there is a paucity of studies on ADHD in Sub Saharan Africa [18] and virtually none assessing the relationship between ADHD and IQ.

Aim of the Study

The current study aimed to compare the IQ of children with ADHD and their counterparts without ADHD.

Materials and Methods

This descriptive cross-sectional study was conducted among primary school pupils in Ikot Ekpene, a semi-urban Local Government Area (LGA) in Akwa Ibom State, Nigeria. The study was carried out over a four-month period from April 2018 to July 2018. One hundred and forty-six pupils with recently diagnosed ADHD were recruited into the study as well as 146 age/sex matched controls. Participants were drawn from 12 primary schools in the Local Government Area.

Ethical approval was obtained from the Health Research and Ethics Committee of the University of Uyo Teaching Hospital, Uyo. Written consent was obtained from the parents of the participants and older children (> 7 years) also gave verbal assent. Only pupils who had been in the class for at least two terms prior and those whose parents consented were recruited into the study. Children with a diagnosis of ADHD who had been commenced on treatment were excluded from the study.

A structured questionnaire, the Vanderbilt ADHD Diagnostic Teacher Rating Scale [19] had been administered by the classroom teacher under supervision by the researchers, and after training sessions (two) were held with the teachers on the proper questionnaire administration. Uniformity of administration of the Vanderbilt Teacher Rating Scale administered by the teachers was assessed class by class, if wrong marking was done, the teacher was retrained and a new questionnaire was administered.

When the score from the Vanderbilt questionnaires of the assessed pupil based on the teacher interviews suggested ADHD, the Draw-a-person test was in turn administered on the child to test his/her IQ as well as on another pupil (control) who was matched for gender, social class and age, and whose questionnaire scores were not in the range suggesting a diagnosis of ADHD. The age of the ‘control’ pupil was within six months of the age of the matched child with ADHD.

Administration of Draw-a-person test

The Draw-a-Person Test [20] which has been successfully administered on Nigerian children by other authors [21,22] was administered on pupils who met the criteria for the diagnosis of ADHD, to assess their level of IQ. For every pupil with ADHD, the DAPT was also administered on a ‘control’ matched for gender, age (within 6 months younger or older than the pupil with ADHD), and socio-economic status.

The pupils (both with ADHD and controls) were made to sit on their normal class seats and the investigator ensured that they were spaced apart from one another to avoid copying and that other pupils in the class did not aid them. Through the instruction of the investigator, the class teacher then gave each child with ADHD, as well as the control, a white plain paper and a sharpened pencil to draw a person. The teacher instructed the pupils to make the very best picture they could and taking their time, working very carefully, and ensuring to draw the whole human being. The investigator and the research assistants were present in all the selected classrooms to ensure no aid was given to the pupils in the drawing. Forty- five minutes was allowed for the drawing after which the pupils submitted their papers to the investigator.

Scoring of the drawing

Scoring of the drawings was done after collating the drawing papers from all the schools. The scoring system designed by Zigler [23] which had been administered on Nigerian children [21,22] was used in this research study. The scoring has fifty-two points for a complete drawing. A point was given for every part of the body the child was able to draw, and these points were added up to arrive at the Draw-a-Person Point (DAPP) for the particular child.

The DAPP obtained was divided by four, and in turn, three points added to arrive at the Draw-a-Person Age (DAPA) for the child. The DAPA was then divided by the child’s chronological age, and the percentage of the resultant value gave the Draw-a-Person Quotient (DAPQ). This is expressed mathematically as follows:

Pupils who had DAPQ of < 75% were classified as having low IQ, while those with DAPQ ≥ 75% were classified as having normal IQ.

Results

Over sixty-six percent of the pupils with ADHD had a low IQ, while about 33% had normal IQ. Conversely only 12.3% of the pupils in the control group had low IQ. Low IQ was 14-fold more likely to be associated with ADHD (OR 14.08). This relationship is shown in table 1.

Intelligent Quotient	ADHD status n (%)		Total (n = 292)	Statistical indices
	ADHD (n = 146)	Control (146)		
Low	97 (66.4)	18 (12.3)	115 (39.4)	OR = 14.08 CI (7.46 - 27.15) $\chi^2 = 89.5295$ P value < 0.0001+
Normal	49 (33.6)	128 (87.7)	177 (60.6)	
Total	146 (100.0)	146 (100.0)	292 (100.0)	

Table 1: Comparison of IQ of pupils with ADHD and controls. +: Significant P value.

Table 2 shows the mean intelligence scores of the pupils with attention deficit disorder and controls. The mean intelligence score of pupils with ADHD (74.7 ± 29.2) was significantly (p = < 0.0001) lower than that of controls (103.5 ± 33.0).

Intelligent quotients	ADHD status		Total (n = 292)	Statistical indices
	ADHD (n = 146)	Control (146)		
Mean score (SD)	74.7 (29.2)	103.5 (33.0)	89.1 (34.3)	Df = 1 tt = 7.8871 P value < 0.0001+

Table 2: Mean intelligence quotient scores of pupils with attention deficit hyperactivity disorder and control. +: Significant p value.

Table 3 highlights the distribution of mean IQ scores across various subtypes of ADHD. The mean IQ scores were lowest among pupils with the Hyperactive subtype (73.2 ± 29.5), this finding was however not significant (p = 0.662).

Intelligence quotient	Hyper-active	Inatten-tive	Combined	Total	Statistical indices
Mean score (SD)	73.2 (29.5)	74.8 (27.7)	81.0 (33.0)	74.7 (29.3)	F = 0.52* P value = 0.66
IQ					
Normal	23 (29.9)	17 (33.3)	9 (50.0)	34 (34.0)	Df = 2 χ ² = 2.6531
Low	54 (70.1)	34 (66.7)	9 (50.0)	66 (66.0)	P value = 0.27
Total	77	51	18	146	

Table 3: Distribution of IQ scores across various subtypes of ADHD. *: Fischer’s exact test.

Discussion

ADHD can pose a challenge to a child both in school and at home. Some people take solace in the misconception that children with ADHD are more intelligent than their normal peers [12]. In this study, however, a majority of the children with ADHD had significantly lower intelligence quotient (IQ) compared to their peers without ADHD. This finding could be due to the impact of limited self-control and impaired sustained attention in these children which may affect the acquisition of intellectual skills. Also, depending on the severity of the child’s symptoms, ADHD can affect the child’s ability to function in school and this may interfere with the child’s application of skills and efficient test-taking skills or knowledge necessary to perform well on an intelligence test [5,9]. The findings of this study are similar to that reported by Skogli., *et al.* [14] in Norway who reported significant lower IQ in children with ADHD. Busch., *et al.* [15] in United States of America also reported a statistically significant difference in the IQ of children with ADHD and those without ADHD.

However, in contrast to our study, Kaplan., *et al.* [16] in Canada reported that the IQ of children with ADHD of children with ADHD

followed a normal distribution and did not differ significantly from the IQ of children with reading disabilities or those with ADHD and co-morbid disorders. This study however had an objective of investigating if IQ was higher in children with ADHD alone than in those with ADHD and co-morbid reading disability, so no children without any neuro-behavioural or learning problems were included. Also, all children with low IQ were all excluded from the study. Another study by Katusic., *et al.* in United States reported a fairly normal distribution of IQ scores among children with ADHD with most of them having average IQ scores. No comparison was made however with controls [12].

This study showed that children with the hyperactive subtype of ADHD had the highest proportion of children with low IQ compared with other subtypes. This finding was in contrast with the finding reported by Natartian., *et al.* [24] of significantly reduced executive functioning in children with ADHD which was more pronounced in the combined subtype compared with other subtypes. The children in the study were however matched for age and IQ scores.

The finding of significantly lower IQ scores among pupils with ADHD when compared to their peers is significant as is the finding that almost two-thirds of children with ADHD in the study area were found to have a low IQ. This has far reaching implications for early identification and educational/pharmacologic interventions to improve long-term outcomes for children with ADHD.

Conclusion

The mean IQ of the pupils with ADHD was significantly lower than that of controls. Policies should be put in place to implement the screening test for ADHD under the school health programme for the early identification of pupils with ADHD.

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