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Original Article

Intelligence Quotient Levels and Sub Tests Comparison in Autistic Children

Vijay Kumar Sah, Hem Sagar Rimal, Archana Rimal
Department of Pediatrics, Nobel Medical College Teaching Hospital, Biratnagar
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Abstract

Background

Autism spectrum disorders (ASD) are disorders of neurodevelopmental origin characterized by social reciprocity deficits, communication deficits, and unusual restricted and repetitive behaviors. In some of these people, measured IQ (Intelligence Quotient) can be normal or even superior or low.

Material and Methods

This is a Retrospective study in autistic children. We have analyzed with autistic disorder, 47 patients had savant skills and 1 patients of MR (Mental Retardation) had savant skills. China- Wechsler Young Children Scale of Intelligence (C-WYCSI) and China-Wechsler Intelligence Scale for Children(C-WISC) were used for calculating IQ levels in different age groups.

Results

Asperger's syndrome (AS) children had higher verbal IQ (VIQ) and full scale IQ (FSIQ) compared to autism and high functional autism (HFA) children with statistical difference. Autism children had lower VIQ, performance IQ and FSIQ compared to HFA and AS children with statistical significance. AS children had higher values in C-WISC and C-WYCSI compared to autism children.

Conclusion

Children with Asperger's syndrome have higher full IQ and Sub test IQ compared with autism and HFA children.

Key Words: *Autism, Asperger's syndrome, IQ (Intelligence Quotient) level, high functional autism, mental retardation*

Introduction

Autism spectrum disorders (ASD) are disorders of neurodevelopmental origin characterized by social reciprocity deficits, communication deficits, and unusual restricted and repetitive behaviors. [1-2]. Aside dysfunctions in the behavior, individuals with autism may present multiple undefiled or even prominent cognitive functions [3]. In some of these autistic individuals, normal or low and even superior measured IQ is a possibility. Thus as in savant syndrome, low IQ score is not the required case in all instances.

Material and Methods

This is a retrospective study of autistic children. Patients visiting the out patients department of Child Developmental and Behavioral Division, Nobel Medical College Teaching Hospital Biratnagar, Nepal were enrolled in this study from August 09,

Correspondence Address:** ***Dr. Vijay Kumar Sah, Lecturer, | E-mail: drvks18@gmail.com

2011 to May 08, 2014.Fourty eight cases were enrolled In the study, out of which 47 patients with autistic disorder and 1 patients of MR. Of these 48 children; there were 45 male, and 3 female with mean and SD of age 7.08 ± 2.31 years. Number of Autistic disorders in children group includes 11 Autism, 10 high functional autism (HFA), and 26 Asperger's syndrome (AS), 1 mental retardation (MR). Children with less than two and half years old and those without IQ report were not included in this study.

China- Wechsler Young Children Scale of Intelligence (C-WYCSI) and China-Wechsler Intelligence Scale for Children(C-WISC) were used for calculating IQ levels in different age groups. C-WYCSI was used as a test for calculating IQ in children between 4 years and 6 years 6 months. The C-WYCSI is a colorful, current, and interesting IQ test for children. It measures Full Scale IQ, Verbal IQ, Performance IQ, and Processing Speed and has an optional General Language Composite. IQ stands for Intelligent Quotient. It indicates a person's intelligence by an intelligence test. The C-WYCSI is composed of 11 subtests: Knowledge, Picture Naming, Arithmetic, Picture summarizing, Comprehension, Animals lay eggs, Picture Completion, Maze, Visual analysis, Block design, Geometry diagram. C-WISC was used as a test for age range between 6 years and 16 years 11 months.

The C-WISC is a test that does not require reading or writing for individual testing. Oral questions are asked in the verbal subtests with no time limits except for mathematical problems. Nonverbal problems make up the performance subtests, all of which have time limits and bonus points are allowed in some of them for rapid work. Older students requiring speed bonuses to obtain better-than-average scores are the criticizing part of C-WISC-III. The C-WISC is composed of 11 subtests: Information, Similarities, Arithmetic, Vocabulary, Comprehension, Digit span, Picture completion, Picture arrangement, Block design, Object assembly, Coding.Verbal IQ (VIQ), Performance (nonverbal) IQ (PIQ), Full Scale IQ (FSIQ), subtests and IQ percentile rank analysis.

SPSS 16.0 (SPSS Inc., Chicago, IL) was used during the analysis. ANOVA (analysis of variance) and Post Hoc analysis (LSD) was done to find out the difference in various C-WISC, C-WYSCI parameters and IQ difference in autistic children. All the variables are expressed as mean ± standard deviation. Any case with $p<0.05$ was considered to be significant.

Results

We compared 3 elements between Autism, HFA and AS. ANOVA (analysis of variance) and Post Hoc analysis (LSD) was done.

Verbal IQ (VIQ) was significant between Autism and HFA (57.6 ± 13.1vs 75.9 ± 12.1, p = 0.010), highly significant between Autism and AS (57.6 ± 13.1vs 102.7 ± 17.5, p = 0.000) and highly significant between HFA and AS (75.9 ± 12.1vs 102.7 ± 17.5, p = 0.000). Performance IQ (PIQ) was significant between Autism and HFA (62.4 ± 14.3vs 85.7 ± 19.1, p = 0.001) and highly significant between Autism and AS (62.4 ± 14.3vs 96.3 ± 14.8, p = 0.000). Full Scale IQ (FSIQ) was significant between Autism and HFA (55.4 ± 11.8vs 78.7 ± 8.4, p = 0.000), significant between Autism and AS (55.4 ± 11.8vs 99.7 ± 13.7, p = 0.000) and significant between HFA and AS (78.7 ± 8.4vs 99.7 ± 13.7, p = 0.000). Result showed that AS children had higher VIQ and FSIQ compared to autism and HFA children with statistical significant difference. Autism children had lower VIQ, PIQ and FSIQ compared to HFA and AS children with statistical significance as shown in table 1.

Table 1: VIQ, PIQ and FSIQ in different children group

	Mean and standard deviation for			p *value	p ** value	p ***value
	Autism n=11	HFA n=10	AS n=26			
VIQ	57.6±13.1	75.9±12.1	102.7±17.5	0.010	0.000	0.000
PIQ	62.4±14.3	85.7±19.1	96.3±14.8	0.001	0.000	0.076
FSIQ	55.4±11.8	78.7±8.4	99.7±13.7	0.000	0.000	0.000

P = Autism vs HFA, p** Autism vs AS, p*** HFA vs AS*

We compared 11 subtests of C-WISC between Autism, HFA and AS children. ANOVA and Post Hoc analysis (LSD) was done. Information subtest was significant between Autism and AS (5.2±3.7vs 14.5±6.3, p = 0.000) and it was also significant between HFA and AS (8.8±3.7vs 14.5±6.3, p = 0.048). Similarities subtest was significant only between Autism and AS (15.2±12.2vs 34.0±5.2, p =0.000).

Arithmetic subtest was significant only between Autism and AS (5.5±4.1vs 13.9±4.8, p= 0.000). Vocabulary subtest was significant only between Autism and AS (4.2±5.0vs 12.6±7.7, p=0.006). Comprehension subtest was significant between Autism and AS (4.5±5.1vs 12.9±4.0, p=0.000) and significant between HFA and AS (7.4±4.2vs 12.9±4.0, p=0.010). Picture completion was significant between Autism and AS (3.0±2.8vs 6.0±2.5, p=0.016). Picture arrangement was highly significant between Autism and AS (1.8±1.4vs 12.8±6.9, p=0.000) and significant between HFA and AS (4.6±3.6vs 12.8±6.9, p=0.007). Block design was significant between Autism and AS (10.2±8.9vs 23.9±13.4, p=0.008) and significant between HFA and AS (11.0±4.0vs 23.9±13.4, p=0.033).

Object assessment was significant only between Autism and AS (4.2±2.2vs 17.2±10.6, p=0.002). Coding was significant between Autism and AS (18.9±9.1vs 40.3±16.7, p=0.001) and significant between HFA and AS (25.0±3.2vs 40.3±16.7, p=0.037) as shown in table 2.

Table 2: C-WISC between autism, HFA and AS children

	Mean and std. deviation for			*p *value*	*p **value*	*p ***value*
	Autism n=8	HFA n=5	AS n=19			
Information	5.2±3.7	8.8±3.7	14.5±6.3	0.263	0.000	0.048
Similarities	15.2±12.2	25.2±13.6	34.0±5.2	0.058	0.000	0.058
Arithmetic	5.5±4.1	9.4±5.0	13.9±4.8	0.154	0.000	0.066
Vocabulary	4.2±5.0	6.6±4.4	12.6±7.7	0.544	0.006	0.085
Comprehension	4.5±5.1	7.4±4.2	12.9±4.0	0.216	0.000	0.010
Digit span	9.4±2.8	9.0±3.2	11.5±2.7	0.816	0.079	0.084
Picture completion	3.0±2.8	4.4±3.9	6.0±2.5	0.385	0.016	0.263
Picture arrangement	1.8±1.4	4.6±3.6	12.8±6.9	0.385	0.000	0.007
Block design	10.2±8.9	11.0±4.0	23.9±13.4	0.910	0.008	0.033
Object assessment	4.2±2.2	9.6±10.0	17.2±10.6	0.316	0.002	0.110
Coding	18.9±9.1	25.0±3.2	40.3±16.7	0.447	0.001	0.037

P = Autism vs HFA, p** Autism vs AS, p*** HFA vs AS*

Result showed that there was difference in various C-WISC parameters between AS children in comparison to Autism and HFA children.

We compared 11 subtests of C-WYCSI between Autism, HFA and AS children. ANOVA and Post Hoc analysis (LSD) was done. Knowledge subtest was significant only between Autism and AS (3.3±1.5vs 10.3±4.6, p=0.019). Picture naming subtest was significant between Autism and HFA (11.0±10.1vs 23.6±3.2, p=0.020) and significant between Autism and AS (11.0±10.1vs 29.4±6.5, p=0.001). Arithmetic subtest was significant between Autism and AS (7.0±6.6vs 13.4±2.8, p=0.032) and significant between HFA and AS (8.2±3.3vs 13.4±2.8, p=0.038). Picture summary was significant only between Autism and AS (18.0±16.7vs 44.1±16.1, p=0.021). Comprehension subtest was significant only between Autism and AS (3.0±5.2vs 11.7±5.5, p=0.032) as shown in table 3.

Table 3: C-WYCSI between Autism, HFA and AS children

	Mean and std. deviation for			*p *value*	*p **value*	*p*** value*
	Autism n=3	HFA n=5	AS n=7			
Knowledge	3.3±1.5	7.0±2.8	10.3±4.6	0.202	0.019	0.157
Picture naming	11.0±10.1	23.6±3.2	29.4±6.5	0.020	0.001	0.149
Arithmetic	7.0±6.6	8.2±3.3	13.4±2.8	0.676	0.032	0.038
Picture summary	18.0±16.7	31.0±9.3	44.1±16.1	0.237	0.021	0.143
Comprehension	3.0±5.2	5.6±4.7	11.7±5.5	0.507	0.032	0.068
Animal lay eggs	43.7±28.2	60.2±12.1	56.4±19.3	0.261	0.354	0.743
Picture completion	4.7±4.5	10.2±5.8	10.0±5.4	0.186	0.178	0.951
Maze	9.7±11.9	15.0±10.2	20.4±10.8	0.511	0.174	0.407
Visual analysis	22.0±5.2	27.6±8.1	31.4±5.4	0.254	0.054	0.327
Block design	2.7±4.6	13.6±10.9	13.4±6.5	0.087	0.076	0.971
Geometric diagram	4.7±5.0	8.6±8.3	12.8±9.0	0.525	0.175	0.394

p= Autism vs HFA, p** Autism vs AS, p*** HFA vs AS*

Result showed that there was difference in various C-WYSCI parameters between AS children in comparison to Autism children. AS children had higher C-WYSCI values in comparison to autism children and there was statistical significant difference seen in knowledge, picture naming, arithmetic, picture summary and comprehension parameters.

Discussion

During our study AS children have higher VIQ, FSIQ compared with Autism and HFA children with statistical significance. Asperger (1944/1991) has spoken of autistic intelligence as a true creative intelligence, adding for success in science or art [4]. And, Fitzgerald (2004), spoke of a number of intellectual prodigies having autistic traits [2] embracing the fact that a person with extraordinary skills might fall within the challenges autistic spectrum. When applied to autistic child, the term 'mental disability' can include disorders as Autism, High Functional Autism (HFA), Asperger's Syndrome (AS). In some of the autistic individuals, normal or low and even superior measured IQ is a possibility. Thus a low IQ score is not the required case in all instances. Some autistic individuals score in the ordinary or extraordinary range on mostly used IQ tests, or at least on few

sub-tests that constitute the overall IQ test battery [5-8].

In our study, there was difference in various C-WISC parameters between AS children in comparison to autism and HFA children. AS children had higher values compared to autism children and statistical difference with $p<0.05$ was seen in all parameters except digit span. In our study, there was difference in various C-WYSCI parameters between AS children in comparison to Autism children. AS children had higher C-WYSCI values in comparison to autism children and there was statistical significant difference seen in knowledge, picture naming, arithmetic, picture summary and comprehension parameters.

Limitations

1. This study has comparatively small sample size. This can lead to some bias during the analysis. A large scale study may be needed for investigating further.
2. We only had few investigations while comparing these children. It may be more helpful to find out the changes in the brain of these children and to justify the reasons for higher full scale IQ and sub IQ test, savant skills in AS children if CT, f-MRI etc. were done.

Conclusions

Children with Asperger's syndrome have higher full IQ and Sub test IQ compared with autism and HFA children.

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