

Intelligence Quotient (IQ) Level in Patients with Autism Spectrum Disorder-A Narrative Study

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Abstract

Autism Spectrum Disorder (ASD) is a dysfunction of the nervous system resulting in significant impairment in social interactions, communication skills, behaviours, and interests. This study aims to assess the correlation between Intelligence Quotient (IQ) and ASD. All papers connected to the topic were reviewed for this purpose throughout 1995 and 2021 by systematically searching internationally available databases such as Web of Science, Science Direct, Scopus, PubMed, and Google Scholar. Finally, 20 relevant studies were selected to extract the results and to interpret the results. The study results showed that 50%-70% of people with ASD have an intellectual disability, and a level of IQ of less than 70 with impaired daily functioning is another feature of this type of patient. Moreover, according to the results of some studies, in ASD patients, Performance IQ (PIQ) is often more than Verbal IQ (VIQ). Based on the results, it can be concluded that ASD disease impairs the level of intelligence of patients, which in the most severe case leads to mental disability. However, due to the limited studies on the level of intelligence of children with ASD, further studies are needed.

Keywords: Intelligence quotient • Autism • Behavioural syndromes

Introduction

ASD is a disorder that is defined as behavioural syndromes and can be a long-term disability [1]. Autism is a widespread developmental condition associated with extreme communication problems in social situations and interaction and stereotyped behaviours, interests, and pursuits [2]. These children have impaired processing of sensory information. Therefore, they show abnormal responses to sensory stimuli (such as avoidant responses and overreactions), damaged emotions and motor skills, and delicate hand movements and activity. As a result, the daily life and play of these children are disturbed [3]. The prevalence of this disorder is 6 per 1000, and it is four times more common in boys [4]. This disorder begins before the age of three, and its defects and abnormalities continue throughout life [5]. Autism is frequently linked with seizures, mental retardation, hyperactivity-shortfall of attention and focus, restlessness or high irritability, and anxiety disorders. In addition, this disorder has recently been considered a biological disorder in neurological development, and many shreds of evidence strengthen its biological background; in this field, we can mention organ-neurological anomalies, neurochemical factors, executive functions, etc. [3]. One subject that has gotten much interest in related studies is the lack of executive functions in this group of patients. Executive function is connected to awareness, logic, and problem solving and includes activities such as set-shifting, set-maintenance, inhibition, set-maintenance, cross-spatial and temporal integration, working memory and regulation [6]. Scientists in early blood studies have suggested that ASD, similar to the amnesic syndrome, is an early memory disorder. This finding was first obtained from behavioural similarities between autistic children and animals with the hippocampus and other middle temporal lesions. Several studies have also shown lesions of the limbic and temporal systems in autism. Similar behaviours in autistic children and animals with hippocampal lesions included: increased general

activity, motor stereotyping, decreased environmental search behaviour, and impaired memory and education.

Over 75% of people with ASD have intellectual disabilities, formerly known as mental retardation [7]. An IQ of less than 70 with impaired daily functioning is another feature of this type of patient [8,9]. According to the results of some studies, in these ASD patients, PIQ is usually higher than VIQ [10,11]. For example, based on the results of epidemiology research conducted by Bertrand, et al. and Chakrabarti and Fombonne how that 60% and 70%, respectively, of ASD children, have a mental disability (IQ<70). However, in the last two studies mentioned above, the sample size was low and equal to 42 and 57 people, respectively. In contrast, in the study of Yeargin-Allsopp, et al., the sample size was higher (n=987); 68% of ASD patients had mental retardation [12]. Since various studies have been performed on the level of cognitive ability in ASD patients, the present study reviews multiple studies and summarizes the results in a narrative review study.

Materials and Methods

A systematic search of internationally available databases, including Web of Science, Google Scholar, PubMed, Science Direct, and Scopus, to review and extract required results from published articles and reports related to the subject was done from 1995-2021. Systematic review using the terms "Intelligence quotient", "IQ", "ASD", "Autistic", "Patients", "Children", "Adults", "Autistic spectrum disorder", "Intellectual disability", "Autism", "Spectrum Quotient", "AQ" was performed. The same Mesh terms were similarly used in other databases. The references of the found studies were checked (Reference Checking) to avoid the potential of missing research. Citation tracing was also reviewed. Based on Figure 1, texts

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Received date: 16 December, 2021; **Accepted date:** 30 December, 2021; **Published date:** 06 January, 2022

were searched, and articles were received based on the PRISMA guideline [13]. Furthermore, unofficial reports, articles referred in letters to the editor, unpublished works, and website information were also removed from the downloaded items list. Finally, the results of 20 published articles were reviewed for the present review.

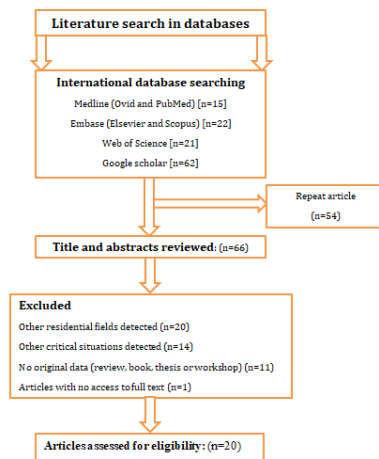


Figure 1. Flow chart of study identification according to PRISMA.

Results and Discussion

Dominion records from the Vineland Adaptive Behaviour Scale (VABS) were correlated with age and PIQ for 72 kids and teenagers with autism and 37 non-autistic children and young adults with impairment of the mind in research by Schatz and Hamdan-Allen. According to the study's findings, children with autism appear to have a different pattern of adaptive functioning than intellectual impairment. Furthermore, advancing age seems to have comparable impacts on the development of adaptive abilities in both populations.

This study's findings suggested that future studies on adaptive behaviour in autism should acknowledge the possibility that high-functioning and low-functioning autistic children have distinct patterns of adaptive behaviour strengths and weaknesses across domains [14]. The Ryland, et al. study measured the relationship between IQ and autistic characteristics in a population-based cohort of adolescent males and females. The study comprised in-depth evaluations of 325 children aged 8–12 years chosen from the Bergen Child Study sample. The Autism Spectrum Screening Questionnaire was used to assess autistic features, while the third edition of the Wechsler Intelligence Scale for Children (WISC-III) was utilised to estimate IQ (ASSQ). Boys scored higher on the ASSQ than girls. The primary influences on ASSQ scores were gender and full-scale IQ (FSIQ), with ASSQ scores for both genders indicating a steady drop with greater FSIQ. ASSQ scores had little correlation with differences in VIQ and PIQ. This study's outcomes highlight the need to carefully assess children before judging their cognitive performance and autistic characteristics [15]. The influence of IQ and age on aptitude in autism individuals was investigated by Dickerson Mayes and Calhoun (2003), who analyzed psychological data for 164 people from 3 to 15-year-olds with autism (IQs 14–143). As children grew older, their IQ developed, which likely reflects a rise in IQ with time and the probability that more intelligent children would be identified later. 67% had regular motor and speech milestones when they were young. During the preschool years, verbal IQ proceeding to linger behind nonverbal IQ. However, the gap between verbal and nonverbal IQs had narrowed by the time they were in school. For all children, visual reasoning outperformed graphomotor scores, and for the majority, it exceeded IQ. Both high-IQ groups had graphomotor scores that were considerably lower than their IQ. In school-aged children with low IQs, writing, spelling, and math, were equivalent to IQ, but reading scores were higher. Reading, mathematics, and spelling were average among school-aged children with high IQs, but the writing was terrible [16].

McGonigle-Chalmers and McSweeney used the Kaufman Assessment

Battery for Children (KABC-II) and the Wechsler IQ Scales (WISC-III) to compare 15 autistic school-aged high functioning children with a neurotypical group to evaluate the effect of the latter test's considerably more challenging timing requirements on the assessment of nonverbal intelligence. Three of the five WISC subtests showed significant group effects, suggesting worse achievement by the ASD group, but not for the KABC, the WISC's highs and lows seem to be more apparent, and on the WISC-III, the assessment of intelligence level for ASD children was likewise considerably lower than on the KABC-II. Finally, the findings demonstrate how children with ASD may be 'matched' to neurotypical groups based on how rapidly their information is processed [17]. Munson, et al. utilized both latent class analysis and taxometrics techniques to categorize Mullen IQs in a sample of 456 children with ASD to explore the probability of more than one different subtype of autism based on IQ. Using both approaches, they discovered proof for different IQ-based groupings. Furthermore, groups varied in terms of intellectual functioning and verbal vs. nonverbal ability patterns. The results back up the theory that there are numerous subtypes of autism that differ in intellectual capacity, cognitive strengths and limitations, and autistic symptom severity [18]. As part of epidemiological research, Charman, et al. performed a comprehensive clinical examination on 156 children aged 10 to 14 years with a mean of 11.7 and standard deviation of 0.9 (81 youth autism, 75 added ASD). Researchers were able to estimate features of the entire ASD group using a unique weighting method. Of such 75 ASD children, 55% had an intellectual impairment (IQ<70), and only 16% had intellectual disability ranging from mild to extreme (IQ<50); 28% had medium intelligence (115>IQ>85), and only 3% had over average in intelligence (IQ>115). There were some hints of a clinically meaningful difference in PIQ and VIQ disparity, although disparities in verbal vs. performance skills were not linked with a specific set of symptoms, as described earlier. While certain previously observed trends were validated (e.g., Poor Comprehension), some were not (e.g., no 'peak' in Block Design). Adaptive capabilities were much lower than IQ and were related to both the severity of early social impairments and IQ. ASD was less significantly linked with intellectual impairment in this epidemiological population than previously thought, and there was only a little evidence of a unique IQ profile. However, even children with ordinary intelligence had substantially worse adaptive outcomes [19]. In the Melling and Swinson study, the Autism Spectrum Quotient (AQ) and the British Ability Scales were used to see if there was a link between autistic-like traits and an overarching index of unevenness based on three sorts of discrepancy scores: discrepancies between IQ subscales, differences between IQ domain scores, and categorizations between overall IQ and word-level literacy skills. The AQ scale was used in this research to assess autistic-like symptoms in people with ASD and the general population at all levels. As a result, the research sample was not limited to children with ASD. The 106 students had an average IQ of 97 (SD=19.6) and an AQ (child version) score of 69.6 (SD=24.6). After controlling for IQ, each of the three types of intellectual difference explained different variations in AQ, with a substantial total effect size. Functional Magnetic Resonance Imaging investigations are suggested based on the findings of this research to see how far unequal intellectual development can be compared to abnormal brain connections [20].

Scheuffgen, et al. used an inspection time task perform the first group study on processing speed in autistic individuals (IQ 1 SD below average). Children with autism had inspection times compared to a sample of young, typically developing children of the same age (IQ 1 SD above average). Even when the groups were comparable on Wechsler IQ, the mentally challenged children with autism were significantly faster than their peers. Despite a low measured IQ, The information processing capacity of children with autism appears to have been retained in this research to the degree that IT activities access individual variations in fundamental efficient processing. The function of general and particular cognitive processes in knowledge and skill development is impacted by these findings: rather than demonstrating that children with autism spectrum disorders are unaffected, our findings suggest that social insight plays a crucial part in the development of "intelligence" evident [21,22,23].

Conclusion

This study suggests that future research on adaptive behaviour in autism should consider the possibility that children with autism who are low-functioning and high-functioning have different strengths and limitations in different areas of adaptive functioning. For example, mathematics, spelling, and writing scores were comparable with IQ for school-aged children with low IQs, but reading levels exceeded IQ. Conversely, children of school age with high IQs had average reading, mathematics, and spelling scores but poor writing ability. Additionally, the different subtypes of autism vary in intellectual capacity, cognitive ability patterns, and the severity of autistic symptoms. According to many research findings, ASD was linked with intellectual impairment less strongly than previously believed, and only a sliver of proof was found to be a unique IQ profile. Additionally, the study discovered that adaptive outcomes were substantially reduced in children with average intellect. Finally, according to specific epidemiological research, between 50% and 70% of children with ASD have an intellectual impairment (IQ<70).

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How to cite this article: Mihandoust, Soada, Somayeh Omid, Sanaz Shahonvand and Fazlollah Shahraki, et al. "Intelligence Quotient (IQ) Level in Patients with Autism Spectrum Disorder- A Narrative Study." *Clin Schizophr Relat Psychoses* 15S (2021). Doi:10.3371/CSRP.MSSO.010622.