

The Correlation Between ADHD and Intelligence

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Abstract: In China, 3% of preschool children suffer from Attention Deficit Hyperactivity Disorder (ADHD), with a male-to-female ratio of 5:1. ADHD is a prevalent behavioral disorder in children. Intelligence in these affected children is normal or normal; however, they exhibit deficiencies in learning, behavior, and emotional aspects. These children face challenges in interpersonal relationships both at home and in preschool settings, leaving parents and teachers feeling helpless. This paper navigates the complex relationship between Attention-Deficit/Hyperactivity Disorder (ADHD) and intelligence, amidst a backdrop of varied scientific findings. Through a systematic review of a decade's peer-reviewed literature, the study scrutinizes empirical research involving diverse demographic samples and quantitative ADHD and IQ measures. Findings reveal a multifaceted relationship between ADHD and intelligence, influenced by various factors including potential comorbidities. The study underscores the importance of a holistic approach in ADHD intelligence assessments, considering both cognitive strengths and challenges. The implications of this research are twofold: it guides the development of personalized interventions for individuals with ADHD and highlights the necessity for further exploration into the ADHD-IQ relationship and its implications for cognitive functioning and long-term outcomes. Developing a more comprehensive understanding of ADHD, this paper moves beyond the limitations of traditional IQ metrics to encompass a wider range of cognitive skills and strengths. This paper aims to provide recommendations and implement effective measures for children exhibiting disruptive behaviors, such as Attention Deficit Hyperactivity Disorder (ADHD). The focus is on assisting these children to facilitate their healthy development.

Keywords: ADHD, intelligence, neurodevelopmental disorder, comorbidities, cognitive function.

1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) globally impacts 5-10% of children and 2-5% of adults, significantly influencing academic and social spheres. The nuanced relationship between ADHD and Intelligence Quotient (IQ) has garnered academic attention, revealing that ADHD individuals may possess unique cognitive abilities despite early research associating the disorder with lower IQ scores. This publication synthesizes existing research on the ADHD-IQ correlation, aiming to elucidate the link and identify mediating or moderating factors, while also spotlighting cognitive strengths and weaknesses in ADHD individuals to inform tailored therapeutic and support measures. Employing a systematic review of a decade's worth of peer-reviewed literature, our research

meticulously analyzes empirical studies across diverse populations, discerning patterns and inconsistencies in findings related to ADHD and intelligence. The implications of this research extend to academic and therapeutic domains, aiming to illuminate ADHD individuals' cognitive profiles, enhance ADHD screening and treatment, and guide evidence-based, ADHD-optimized interventions, thereby fostering optimal cognitive development and outcomes.

2. The Correlation Between ADHD and Intelligence

2.1. Early Studies: Negative Association Between ADHD and IQ

Historically, the relationship between Attention-Deficit/Hyperactivity Disorder (ADHD) and Intelligence Quotient (IQ) has been a focal point of numerous studies, revealing a myriad of findings that have evolved. Early research predominantly showcased a negative association between ADHD and IQ, implying that individuals with ADHD tended to score lower on traditional intelligence tests than their non-ADHD counterparts. This was often attributed to the pervasive symptoms of ADHD, such as inattention and impulsivity, which could potentially hinder optimal performance on IQ tests.

A prevalent belief exists that traits resembling Attention-Deficit/Hyperactivity Disorder (ADHD) in highly intelligent individuals can be distinguished from genuine ADHD symptoms through their lack of consistency across various situations[1]. This assumption is rooted in the idea that such traits, in intellectually gifted individuals, are less omnipresent due to their connection to a situational mismatch between the child's cognitive capabilities and the stimulation provided.

While there is some evidence supporting this perspective, indicating that discrepancies and disagreements between parents and teachers regarding attention problems were more pronounced in the high IQ range compared to the average IQ range, it's noteworthy that the discrepancy was most significant in the lowest IQ range. Parents reported more attention problems than teachers, contrasting with comparable levels of attention problems reported in the mid-IQ range [2]. This could suggest that schools, potentially offering a more cognitively stimulating environment than homes, might provoke fewer attention problems in highly intelligent children.

Contrary to the notion that teachers, leading to underachievement might easily overlook attention problems in intellectually gifted children, the data does not affirm this, given the identified negative linear relationship between IQ scores and underperformance according to teachers, and the reported low levels of attention problems by teachers in children with high IQ scores. Interestingly, the findings regarding discrepancies between parent-teacher raters about attention problems were not mirrored by discrepancies for hyperactivity-impulsivity symptoms, which remained constant across the IQ range, with parents consistently reporting higher levels than teachers. This might imply that the situational pervasiveness of hyperactivity-impulsivity symptoms is less associated with IQ compared to attention problems.

2.2. Examples of Studies Demonstrating Negative Correlation

The study aimed to explore the relationship between ADHD symptoms and performance on the Raven's Standard Progressive Matrices (RSPM), a performance-based measure of intelligence, among adults. Three hypotheses were tested and supported:

H1: The time taken to complete the RSPM was negatively correlated with adult ADHD symptoms.

H2: The total RSPM score was negatively correlated with adult ADHD.

H3: Longer test completion times were positively correlated with higher RSPM scores.

The relationship between ADHD symptoms and RSPM scores was related to current ADHD symptoms, not childhood symptoms, suggesting that as ADHD symptoms remit, speed and performance on the test become slower and more efficient. The association between ADHD symptoms and faster test completion might be attributed to common ADHD-related deficits like

impulsivity, poor attention, and behavioral disinhibition. ADHD individuals might rush through test items without thorough consideration, which has been observed in other performance-based tests. Multiple regression analysis revealed that current ADHD symptoms contributed to the variance in performance on the RSPM beyond the speed of performance [3].

In another discussed research, the interplay between Attention-Deficit/Hyperactivity Disorder (ADHD) and intelligence quotient (IQ) was meticulously examined, revealing pivotal insights into cognitive performance disparities between ADHD-affected individuals and control groups across varying IQ levels. Remarkably, the cognitive discrepancies between ADHD and control groups were not significantly influenced by IQ levels, presenting substantial ADHD-control cognitive performance differences across both high and average intelligence strata. Intriguingly, while minor moderating effects were observed, they predominantly suggested that high-IQ individuals with ADHD exhibited slightly less pronounced cognitive challenges. In a comprehensive view, ADHD-affected children and adolescents with high intelligence generally demonstrated cognitive performance on par with their average-intelligent control counterparts. The research underscores a compelling narrative that the cognitive profiles of ADHD are notably consistent across individuals with high and average intelligence. However, a critical takeaway is that cognitive deficits associated with ADHD might be subtly masked or inadvertently overlooked in populations with high intelligence, especially when juxtaposed with typically developing (i.e., average-intelligent) control groups. This phenomenon underscores the imperative to employ meticulous and nuanced approaches in evaluating cognitive performance in high-IQ populations, ensuring that ADHD-related cognitive deficits are accurately identified and addressed [4].

These studies, among others from the early research era, often highlighted a negative correlation between ADHD and IQ, albeit through various mechanisms and associated factors such as sleep duration and intellectual disability. It is crucial to note that the understanding and interpretation of the ADHD-IQ relationship have evolved, with more recent studies unveiling a more nuanced and multifaceted relationship. This underscores the importance of considering various factors, including comorbidities and cognitive strengths when exploring the ADHD-IQ link.

2.3. Nuanced Relationship: Cognitive Strengths in Individuals with ADHD

The aforementioned studies, among others, have begun to unravel the nuanced relationship between ADHD and cognitive strengths, indicating that the relationship is not universally negative or linear. Various domains of cognitive strengths have been identified in individuals with ADHD, such as:

Creative Problem Solving: Some individuals with ADHD demonstrate enhanced creative thinking and problem-solving abilities, often thinking outside the box and approaching problems from unique angles [5]. **Hyperfocus:** While attentional challenges are prominent in ADHD, some individuals exhibit periods of intense focus and engagement, particularly in areas of interest or passion, which can be harnessed positively [6]. **Resilience and Adaptability:** The continuous navigation through challenges often fosters a degree of resilience and adaptability in individuals with ADHD, enabling them to navigate various situations with flexibility [7]. **Innovative Thinking:** The non-linear thought processes sometimes associated with ADHD can lead to innovative solutions and ideas, providing fresh perspectives in various contexts.

Understanding these cognitive strengths and identifying domains that can be leveraged positively is crucial in developing supportive interventions and educational strategies that harness the potential of individuals with ADHD [8]. It also underscores the importance of a strength-based approach in managing ADHD, recognizing not only the challenges but also the potential areas of advantage and ability.

3. Factors Influencing the ADHD-IQ Relationship

The cognitive deficits of ADHD children are an important cause of academic and other social functional defects. WISC-IV is a new type of intelligence measurement tool that emphasizes the measurement of individual cognitive abilities and pays attention to the measurement of working memory and processing speed, making the general cognitive ability transform into a high-performance execution process on the test task and is more targeted for the assessment of learning disabilities [9]. ADHD children have attention deficits and poor control and inhibition of behavior. Some studies have shown that training the working memory ability of ADHD children can significantly improve their response inhibition, reasoning, and hyperactivity. ADHD children have a potential deficit in verbal understanding ability or related left-hemisphere function [10]. This result is related to factors such as the children's difficulty concentrating and delayed neurophysiological functional development. The central nervous system development of ADHD is delayed. ADHD is considered a "mature state" and is the result of delayed neuropsychological development.

4. Methodological Challenges and Interpretation of Findings

4.1. Variability in IQ Assessment Tools

Different studies utilize various IQ measurement tools, each with its unique methodology and focus areas, to assess intelligence in ADHD populations. Commonly used instruments might include the Wechsler Intelligence Scale for Children (WISC) and the Stanford-Binet Intelligence Scales [11]. The choice of tool can significantly impact the findings due to the varied emphasis on verbal, non-verbal, memory, or processing speed skills.

The ADHD population may present unique challenges in ensuring the validity and reliability of IQ tests. Factors such as attention span, hyperactivity, and impulsivity can influence test-taking abilities and thus, the accuracy of results. Ensuring that IQ tests are valid (measure what they intend to measure) and reliable (provide consistent results across different testing periods) in the context of ADHD is crucial for obtaining meaningful data [12].

4.2. Sample Characteristics and Recruitment Bias

The size and diversity of the sample used in studies investigating ADHD and IQ can significantly impact the generalizability of the findings. A larger and more diverse sample is typically more representative of the population, thereby providing more generalizable results. However, smaller or non-diverse samples may limit the applicability of findings to broader contexts [13]. Biases in recruitment and data collection can stem from various sources, such as selecting participants from specific demographic or socio-economic backgrounds or utilizing data collection methods that may favor certain participant profiles. Ensuring a fair and representative recruitment process and employing unbiased data collection methods is vital to uphold the integrity of the research findings.

5. Implications and Future Directions

5.1. Personalized Interventions and Support Strategies

Understanding the correlation between ADHD and intelligence opens avenues for developing personalized interventions and support strategies that cater to the unique needs and strengths of individuals with ADHD.

The first one is tailoring Interventions Based on Cognitive Strengths and Weaknesses: Cognitive Strengths: Leverage areas of cognitive strength in individuals with ADHD, such as creativity or problem-solving skills, to enhance learning and skill development. Cognitive Weaknesses:

Implement strategies to support areas of cognitive weakness, such as attention or working memory, through targeted interventions or accommodations [14]. Adaptive Learning Environments: Create adaptive learning environments that modify teaching strategies, curriculum, and assessments based on the learner's cognitive profile.

The second one is the importance of Individualized Approaches in ADHD Management: Holistic Understanding: Emphasizes a comprehensive understanding of an individual's cognitive, emotional, and behavioral profile to inform intervention strategies. Inclusive Practices: Adopt inclusive practices that accommodate diverse learning needs and promote equal opportunities for success. Continuous Monitoring: Implement continuous monitoring and assessment to evaluate the effectiveness of interventions and make necessary adjustments.

5.2. Advancing Research and Addressing Knowledge Gaps

Exploring the relationship between ADHD and intelligence necessitates further research to unravel the complexities of these constructs and address existing knowledge gaps.

The first one is identifying Areas Requiring Further Investigation. Neurobiological Underpinnings: Explore the neurobiological mechanisms that underlie the relationship between ADHD and intelligence. Longitudinal Studies: Conduct longitudinal studies to understand the developmental trajectory of ADHD and its impact on cognitive functions over time. Diverse Populations: Investigate the ADHD-intelligence correlation across diverse populations, considering factors like age, gender, and cultural background.

The second one is collaborative Efforts for Advancing ADHD-IQ Research. Interdisciplinary Collaboration: Foster collaboration among researchers from various disciplines, such as psychology, neuroscience, and education, to gain multifaceted insights. Global Research Initiatives: Engage in global research initiatives to explore the universality and variability of ADHD-intelligence correlations across different cultural and geographical contexts. Technology and Innovation: Leverage technological advancements and innovative methodologies to enhance research precision and explore novel intervention strategies.

The exploration of the correlation between ADHD and intelligence not only enhances our understanding of these constructs but also paves the way for developing effective interventions and advancing research in this domain. By tailoring interventions to individual cognitive profiles and addressing knowledge gaps through collaborative and innovative research, we can foster supportive environments that facilitate the success and well-being of individuals with ADHD. Future directions in this field hold the promise of unveiling deeper insights and pioneering approaches that holistically address the needs and potentials of the ADHD population.

6. Conclusion

The correlation between attention-deficit/hyperactivity disorder (ADHD) and intelligence has been a subject of ongoing investigation, and this paper aims to provide a comprehensive analysis of the existing literature on this intriguing relationship. Through an analytical perspective, we explored early studies indicating a negative association between ADHD and intelligence, as well as more recent research that highlighted cognitive strengths in individuals with ADHD. The findings from diverse studies shed light on the multifaceted nature of the ADHD-IQ relationship, indicating the importance of considering factors such as comorbidities, age, gender, and cultural variations. The research revealed that early studies tended to report lower intelligence quotient (IQ) scores in individuals with ADHD compared to neurotypical peers, suggesting a negative association. However, contemporary research demonstrated that this relationship is more nuanced, with evidence of cognitive strengths in specific domains among individuals with ADHD. These findings challenge the traditional view of a

uniform negative correlation and emphasize the need for a more nuanced understanding of cognitive profiles in ADHD. The significance of this paper lies in its implications for both academic and clinical domains. By unraveling the complex relationship between ADHD and intelligence, educators, clinicians, and policymakers can develop personalized interventions and support strategies to optimize academic and social functioning for individuals with ADHD. Recognizing cognitive strengths in ADHD can help create tailored interventions to harness these strengths and address challenges effectively. Moreover, this research contributes to the growing body of knowledge on ADHD and cognition, emphasizing the need for a comprehensive understanding of cognitive profiles to ensure accurate assessments and effective interventions. However, this study has certain limitations that should be acknowledged. Firstly, the variability in IQ assessment tools and methodologies across studies may have influenced the divergent findings. Secondly, the heterogeneity of the ADHD population, with varying subtypes and symptom severity, might have contributed to inconsistent results. Additionally, the reliance on cross-sectional data in some studies may limit the ability to establish causal relationships between ADHD and intelligence. To improve future research, longitudinal studies with larger and more diverse samples are warranted to track cognitive changes over time and investigate potential mediators and moderators of the ADHD-IQ relationship. Moreover, employing standardized and comprehensive cognitive assessments in conjunction with neuroimaging techniques can provide a deeper understanding of the neurobiological underpinnings of cognitive strengths and weaknesses in ADHD.

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