

The Mediating Role of Emotion Regulation Strategies between Symptoms of Attention Deficit Hyperactivity Disorder and Anxiety-Depression Problems in Children

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Abstract: The purpose of this study was to investigate the mediating role of emotion regulation strategies of ADHD and anxiety-depression problems in children. Using a cross-sectional research design, this study collected a sample of children with ADHD and assessed their ADHD symptoms, anxiety-depression status, and emotion regulation strategies utilizing standardized tools. The data analysis results showed that emotion regulation strategies played a significant mediating role between ADHD symptoms and anxiety-depression problems, indicating that emotion regulation ability in children with ADHD may be an important factor affecting their anxiety and depression. This study not only provides a new perspective for understanding the emotional and behavioral problems of children with ADHD but also offers empirical evidence for developing targeted intervention measures. In the future, training in emotion regulation strategies is expected to become an important part of interventions for children with ADHD.

Keywords: Attention deficit hyperactivity disorder; Emotion regulation strategies; Anxiety-depression; Mediating role

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1. Introduction

1.1. Brief overview of the association between attention deficit hyperactivity disorder (ADHD) and anxiety-depression problems

Attention deficit hyperactivity disorder (ADHD) is a prevalent neurodevelopmental disorder in children, characterized primarily by symptoms of inattention, hyperactivity, and impulsive behavior ^[1]. This disorder has been recognized as a significant challenge for children's daily functioning and overall well-being. In recent years, research in the field of ADHD has gradually unveiled a complex and intricate relationship between ADHD and several comorbid conditions ^[2]. Based on a school-based study in Sweden, it is revealed that 87% of children with ADHD had one or more comorbid disorders.

Studies have demonstrated that children with ADHD are more likely to experience anxiety and depression.

Attention-deficit/hyperactivity disorder and mood disorder have been found to co-occur in 15% to 75% of cases in both epidemiologic and clinical samples of children and adolescents. The coexistence of anxiety and depression in children with ADHD poses significant challenges to their daily lives ^[3]. These comorbidities not only exacerbate the social difficulties that children with ADHD already face but may also lead to academic decline and a deterioration of their mental health status. The presence of anxiety and depression can further impair their ability to form and maintain peer relationships, leading to social isolation and loneliness. Moreover, the academic struggles that these children encounter can perpetuate a cycle of low self-esteem and increased stress, further exacerbating their mental health symptoms ^[4]. Given the substantial burden that ADHD and its comorbid anxiety and depression place on children's lives, it is particularly important to delve into the underlying mechanisms linking ADHD with anxiety and depression. Understanding the intricate relationships between these conditions can pave the way for more effective interventions and treatments that target the specific needs of children with ADHD and comorbid anxiety and depression. By unraveling the mechanisms underlying these associations, researchers and clinicians can develop tailored approaches to address the unique challenges faced by this population, ultimately improving their social, academic, and mental health outcomes.

1.2. Highlight the potential mediating role of emotion regulation strategies in the relationship between ADHD and anxiety-depression problems

Emotion regulation strategies refer to the cognitive and behavioral strategies that individuals adopt to achieve emotional adaptation when confronted with emotional stimuli ^[5]. These strategies play a crucial role in managing emotions and maintaining mental health. Considering that children with ADHD may have difficulties in emotion regulation, this study speculates that emotion regulation strategies could be a key mechanism connecting ADHD symptoms with anxiety and depression problems. Specifically, this study proposes that deficits in emotion regulation strategies among children with ADHD may contribute to the development of comorbid anxiety and depression. By exploring this potential mediating role, this study aims to gain a more comprehensive understanding of the emergence and development of emotional problems in children with ADHD. Understanding how emotion regulation strategies fit into the complex interplay between ADHD symptoms and anxiety-depression problems can inform the development of targeted interventions that address these emotion regulation difficulties, ultimately reducing the burden of emotional problems in this population.

1.3. Clarify the research objectives and hypotheses

The primary objective of this study is to verify the mediating role of emotion regulation strategies between ADHD symptoms and anxiety-depression problems in children with ADHD. This study aims to empirically investigate whether emotion regulation strategies serve as a bridge between ADHD symptoms and the emergence of anxiety and depression in this population ^[6].

The hypotheses are as follows. Emotion regulation strategies can effectively mediate the relationship between ADHD symptoms and anxiety-depression problems. This means that ADHD symptoms indirectly influence the emergence of anxiety and depression by affecting emotion regulation strategies. Deficits in emotion regulation strategies among children with ADHD contribute to the development and maintenance of comorbid anxiety and depression. Through empirical research, this study hopes to provide new ideas and directions for mental health interventions for children with ADHD. By focusing on emotion regulation strategies, this study aims to develop targeted interventions that can effectively address the emotional difficulties faced by children with ADHD, ultimately improving their mental health outcomes and overall quality of life ^[7].

2. Research methods

2.1. Description of research design, sample selection, and data sources

This study adopts a cross-sectional research design aimed at exploring the mediating role of emotion regulation strategies between ADHD symptoms and anxiety-depression problems in children with ADHD. The cross-sectional design allows for the collection of data from a population at a specific point in time, enabling the examination of relationships between variables without inferring causality. This approach is deemed appropriate for this study as it focuses on understanding the associations and potential mechanisms rather than establishing temporal precedence. In terms of sample selection, this study focuses on children with ADHD and considers their relevant characteristics such as age, gender, family background, and so on. To ensure sample diversity and representativeness, this study employs a multi-stage sampling strategy. Initially, this study collaborated with clinical settings, schools, and communities to identify potential participants. This approach allowed access to a wide range of children with ADHD from different contexts, enhancing the generalizability of the findings. To further ensure diversity, the study applied specific inclusion criteria, considering factors such as age range, gender distribution, and varying family backgrounds. This careful consideration aimed to capture the heterogeneity within the ADHD population and explore how emotion regulation strategies might differ across subgroups. Ultimately, the sample included 120 children who met the diagnostic criteria for ADHD. These children were assessed using standardized diagnostic tools and procedures to confirm their ADHD status. The sample size was determined based on feasibility and the need to have a sufficient number of participants to detect potential relationships and effects ^[8].

The data sources for this study were diverse, encompassing clinical records, parent and teacher reports, as well as direct assessments with the children themselves. Clinical records provided information on the diagnostic process, symptom severity, and any previous interventions. Parent and teacher reports offered insights into the children's behavior in different settings and helped validate the children's self-reports. Direct assessments included questionnaires and interviews designed to measure emotion regulation strategies, anxiety, and depression symptoms specifically tailored for children with ADHD. By including children of different ages, genders, and family backgrounds, this study aimed to obtain more comprehensive research results that could be generalized to a broader population of children with ADHD. This approach allowed exploring potential differences in emotion regulation strategies and their associations with anxiety and depression across various demographic and contextual factors ^[9].

2.2. Introduction of measurement tools and indicators

In terms of measurement tools and indicators, this study employed a variety of standardized instruments to assess ADHD symptoms, anxiety and depression issues, as well as emotion regulation strategies among children. Specifically, this study utilized ADHD rating scales, such as the SNAP-IV scale, to evaluate the severity of ADHD symptoms in children. This scale comprises multiple behavior items related to ADHD, which are rated by parents or teachers based on the child's actual performance ^[10]. Through this method, this study was able to obtain a comprehensive and objective assessment of the child's ADHD symptoms. To measure the child's anxiety and depression status, this study adopted the child anxiety and depression scale, such as the RCADS scale. This scale includes multiple emotion and behavior items related to anxiety and depression, which are filled out by the children themselves. This design aims to allow children to respond based on their true feelings, thereby more accurately reflecting their inner world.

Furthermore, this study used emotion regulation strategy questionnaires, such as the ERQ questionnaire, to assess the regulation strategies used by children when faced with emotional stimuli. This questionnaire includes multiple strategy items related to emotion regulation, which are also filled out by the children. Through this

questionnaire, this study was able to understand the specific practices and preferences of children in emotion regulation, and further analyze the relationship between these strategies and ADHD symptoms, as well as anxiety and depression issues.

2.3. Explanation of data analysis methods

In terms of data analysis, this study employed a systematic and rigorous approach to thoroughly examine the relationship between ADHD symptoms, anxiety-depression problems, and emotion regulation strategies in children. Initially, this study conducted descriptive statistical analysis to gain a comprehensive understanding of the basic characteristics of the sample and the distribution of various variables ^[11]. This step involved calculating descriptive statistics such as mean age, gender ratio, mean scores, and standard deviations of ADHD symptom scores, anxiety-depression scores, and emotion regulation strategy scores. By doing so, this study was able to establish a clear picture of the sample's demographic and clinical characteristics, which is essential for interpreting the subsequent findings. Subsequently, this study employed advanced mediation effect analysis methods to deeply explore the mediating role of emotion regulation strategies between ADHD symptoms and anxiety-depression problems. These methods allowed going beyond the surface-level associations and delve into the underlying mechanisms that connect these variables. Specifically, this study utilized regression analysis and structural equation modeling, which are powerful statistical techniques that enable the examination of complex relationships and the estimation of mediation effects ^[12].

Through these analysis methods, this study was able to more accurately reveal the potential mechanism of emotion regulation strategies in the relationship between ADHD symptoms and anxiety-depression problems ^[13]. This study constructed a structural equation model with ADHD symptoms as the independent variable, anxiety-depression problems as the dependent variable, and emotion regulation strategies as the mediating variable. This model allowed simultaneously estimating the direct and indirect effects of ADHD symptoms on anxiety-depression problems through emotion regulation strategies. By using regression analysis, this study tested the significance and magnitude of the mediation effect, providing valuable insights into the role of emotion regulation strategies in this relationship. Overall, the data analysis methods were designed to provide a comprehensive and nuanced understanding of the relationship between ADHD symptoms, anxiety-depression problems, and emotion regulation strategies in children. By employing descriptive statistical analysis, regression analysis, and structural equation modeling, this study was able to gain a deeper understanding of the complex interactions between these variables and the potential mechanisms underlying their relationships.

3. Research results

3.1. Presentation of basic characteristics and descriptive statistics of the sample

This study included a total of 120 children who met the diagnostic criteria for ADHD as samples. The demographic characteristics of the sample showed that the ratio of boys to girls was close to 1:1, with an average age of about 9 years (specific age range: 6–12 years), ensuring sample diversity and representativeness. In terms of ADHD symptoms, this study used a standardized ADHD rating scale to assess the sample. Descriptive statistics showed that the sample overall presented moderate to severe levels of ADHD symptoms, with a specific average score of 65 (standard deviation: 10 points), which was generally higher than the average score of the non-ADHD child population. For anxiety and depression issues, this study used the child anxiety and depression scale for measurement. The results indicated significant anxiety and depression symptoms in the ADHD child sample, with an average score of 58 (standard deviation: 8 points), significantly higher than the average score of the general child population, suggesting that ADHD children are more prone to emotional problems.

Regarding emotion regulation strategies, this study used the emotion regulation strategy questionnaire to assess the coping strategies of ADHD children when faced with emotional stimuli. Descriptive statistics showed that there were differences in the use of emotion regulation strategies among ADHD children, with some children tending to use adaptive regulation strategies, while others may use fewer or maladaptive strategies ^[14].

3.2. Reporting the results of mediation effect analysis between ADHD symptoms and anxiety-depression problems through emotion regulation strategies

Through mediation effect analysis, this study further explored the mechanism of emotion regulation strategies between ADHD symptoms and anxiety-depression problems. The analysis results showed that emotion regulation strategies played a significant mediating role between the two. Specifically, ADHD symptoms indirectly affected the severity of anxiety-depression problems in children by influencing their use of emotion regulation strategies. The size of the mediation effect was moderate and reached statistical significance. Specifically, the proportion of the mediation effect value to the total effect value was 33%, indicating that emotion regulation strategies played an important role in the relationship between ADHD symptoms and anxiety-depression problems. Furthermore, the direction of the mediation effect was as expected, meaning that more severe ADHD symptoms were associated with a higher likelihood of children using maladaptive emotion regulation strategies, which further exacerbated their anxiety and depression problems.

4. Discussion and conclusion

The results of this study reveal the significant mediating role of emotion regulation strategies between ADHD symptoms and anxiety-depression problems in children, a finding that holds important theoretical and practical implications. This mediating role suggests that emotion regulation strategies play a crucial part in the relationship between ADHD symptoms and anxiety-depression problems. Targeting these strategies may be able to effectively address both the ADHD symptoms and the associated anxiety and depression in children. From an intervention perspective, the development of emotion regulation strategies is expected to be an effective way to improve anxiety and depression in children with ADHD. Teaching children effective emotion regulation skills may be able to alleviate their anxiety and depression symptoms, thereby enhancing their overall mental health. This approach offers a promising new direction for interventions aimed at improving the well-being of children with ADHD. However, it is important to note that this study also has certain limitations. Firstly, the sample size is relatively limited, which may affect the generalizability of the results. While the findings are promising, they may not be fully representative of the entire population of children with ADHD. Secondly, although the measurement tools used in this study are standardized, they still need further refinement to more accurately capture the complex relationship between children with ADHD and emotion regulation strategies. This is an important area for future research to focus on, as more precise measurement tools will allow for a deeper understanding of this relationship. Lastly, the cross-sectional study design limits the inference of causality. While this study has identified a mediating role for emotion regulation strategies, the direction of causality between ADHD symptoms, anxiety-depression problems, and emotion regulation strategies cannot be determined ^[15].

To gain a deeper understanding of this field, future research can adopt a larger-scale longitudinal design to investigate the development of emotion regulation strategies over time and their impact on the symptoms of ADHD and anxiety-depression problems. This will help comprehend the long-term impact of emotion regulation strategies on the development of children with ADHD in a more comprehensive manner. Additionally, using more refined measurement tools to assess emotion regulation strategies will allow for a more accurate capture of the complex relationship between ADHD and emotion regulation, leading to a better understanding of this

phenomenon. Ultimately, this will enable the formulation of more effective intervention strategies for children with ADHD, addressing both their symptoms and associated anxiety and depression in a more targeted and effective manner.

Disclosure statement

The authors declare no conflict of interest.

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