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Stress and ADHD: The role of emotional intelligence in coping and regulation

Maria Anastasia Pothitou ^{1, 2, *}

¹ Department of Sociology, Panteion University of Social and Political Sciences, Athens, Greece.

² Department of Greek Philology, Democritus University of Thrace, Greece.

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Abstract

Attention Deficit Hyperactivity Disorder (ADHD) is a common neurodevelopmental disorder that in many cases has been associated with increased levels of stress, emotional dysregulation and difficulties in adaptive functioning. Individuals with ADHD often exhibit increased emotional reactivity and reduced ability to effectively manage internal and external stressors. The aim of the present study is to examine the relationship between stress and ADHD, with a particular focus on the role that emotional intelligence can play as a protective and supportive factor. To achieve this aim, a literature review was conducted with studies published between 2000 and 2025. The findings of the review suggest that emotional intelligence may contribute to improved self-awareness, emotional regulation, stress management and interpersonal functioning in people with ADHD. Furthermore, interventions aimed at enhancing emotional intelligence appear to support resilience and adaptive coping in educational and therapeutic settings. In conclusion, the current literature suggests that emotional intelligence can be an important complementary dimension in the management of stress in individuals with ADHD.

Keywords: ADHD; Stress; Emotional Intelligence; Emotional Regulation; Coping; Interventions

1. Introduction

Attention Deficit Hyperactivity Disorder (ADHD) is one of the most common neurodevelopmental disorders. Its key features include persistent patterns of inattention, hyperactivity and impulsivity that interfere with individuals' daily functioning and development (American Psychiatric Association, 2013). However, in addition to its core symptoms, ADHD has also been associated with deficits in executive functioning and emotional self-regulation, which can significantly affect academic performance, social adjustment and psychological well-being (Angelopoulou, Karabatzaki & Drigas, 2021).

In recent years, increasing attention has been paid to the relationship between ADHD and anxiety. Individuals with ADHD often experience higher levels of perceived stress, as difficulties in controlling attention, regulating behaviour and emotional balance can make it more difficult to manage everyday demands and situations (Zografou & Drigas, 2022). Anxiety is likely to further intensify the cognitive and emotional difficulties experienced by people with ADHD, creating a mutual interaction in which ADHD symptoms and anxiety reinforce each other.

In this context, emotional intelligence has emerged as a particularly important concept in order to understand how individuals manage emotional experiences and stressful situations.

Emotional intelligence is generally described as the ability to perceive, understand, regulate and use emotions effectively in oneself and others (Mayer et al., 2008). Research has shown that generally higher levels of emotional

* Corresponding author: Maria Anastasia Pothitou

intelligence are associated with better psychological adjustment, stronger resilience and more adaptive responses to stress (Drigas & Papoutsis, 2020).

Given that individuals with ADHD often display emotional dysfunction and stress management difficulties, the role of emotional intelligence deserves special attention. The present study examines the relationship between stress and ADHD, focusing on the contribution of emotional intelligence to coping, regulation and adaptive functioning.

Finally, we stress the significance of all digital technologies in the field of education and in ADHD training, which is highly effective and productive and facilitates and improves assessment, intervention, and educational procedures via mobile devices that bring educational activities everywhere [35], various ICT applications that are the main supporters of education [36-38], and AI, STEM, and ROBOTICS that elevate educational procedures to new performance levers [39-44]. Additionally, the development and blending of ICTs with theories and models of metacognition, mindfulness, meditation, and emotional intelligence cultivation [45-48] accelerates and improves the educational practices and results, particularly in children with ADHD, treating domains and their practices like assessment and intervention.

2. Theoretical Foundations of Stress, ADHD and Mindfulness

2.1. Emotional intelligence and stress in ADHD

Stress is a natural adaptive response of individuals in circumstances where there are perceived challenges or threats. However, chronic or excessive stress during childhood can disrupt an individual's cognitive, emotional and neurobiological development (Lupien et al., 2009). Particularly in the case of children with ADHD, stress often occurs more frequently, to a greater degree and they experience greater difficulty in managing it compared to their typical peers (Seymour et al, 2012). The executive function deficits that characterize ADHD make these children more vulnerable to stress and less able to cope effectively with stress-inducing situations.

Contemporary research has made it evident that children with ADHD show increased physiological and emotional reactivity to stressful situations. Isaksson et al. (2012) used salivary cortisol as a biomarker of hypothalamic-pituitary-adrenal (HPA) axis activation and identified reduced or dysfunctional cortisol responses in children with ADHD, suggesting the presence of a dysregulated stress response system in these cases. Although some children appear hyper-responsive to stress, others show under-responsiveness. However, both patterns are maladaptive and are likely to contribute to anxiety, sleep disturbances and irritability.

Moreover, anxiety is considered one of the most aggravating factors for individuals with ADHD, as it is closely associated with executive difficulties and self-regulation problems (Zografou & Drigas, 2022). Children with ADHD often perceive everyday situations, such as for example social interactions or academic demands, as more stressful than their typically developing peers. This may, in part, be explained by their difficulties in attentional concentration and cognitive appraisal, which limit their ability to interpret situations they experience in a realistic way or to reframe the challenges they encounter in a more positive way. As a result of these difficulties, even minor frustrations can escalate into full-blown emotional or behavioural crises, further increasing anxiety for both the child and their caregivers (Hirvikoski et al., 2009).

In addition, chronic stress in children with ADHD has been associated with impairments in attention concentration, memory, and executive function, areas that are already impaired in this population. Indeed, Liston et al. (2009) argue that prolonged exposure to stress hormones, such as cortisol, can lead to structural changes in the prefrontal cortex and hippocampus, areas essential for learning and self-regulation. This biological vulnerability can exacerbate academic difficulties and contribute to a cycle of frustration, avoidance and negative feedback from teachers or parents.

Particularly in the school setting, anxiety-related difficulties can manifest in the form of difficulty concentrating, incomplete schoolwork, test anxiety, and emotional outbursts during the learning process or exams. When academic anxiety builds up, it can lead to withdrawal from school, greater risk of grade retention, and even dropping out of school during adolescence (DuPaul & Stoner, 2014). These outcomes are not only the result of the underlying symptoms of ADHD, but are also significantly modulated by exposure to stress and inadequate coping mechanisms (Kofler et al., 2019).

One of the most well-documented consequences of stress in children with ADHD is emotional dysfunction, i.e., difficulty regulating emotional responses to different situations and different stimuli. Children with ADHD often find it difficult to manage negative emotions, such as frustration, resulting in them becoming easily irritated and displaying very frequent mood swings, which in turn are likely to elicit negative reactions from adults and peers, reinforcing feelings of rejection

and failure (Martel, 2009). Over time, this pattern may contribute to the development of internalised difficulties, for example chronic anxiety and depression, which commonly co-occur with ADHD (Sciberras et al, 2017).

In addition, exposure to high levels of anxiety has been associated with an increased likelihood of developing externalised negative behaviours, such as aggression, defiance or rule-breaking. These types of behaviours are often misinterpreted as intentional offending behaviour, when in fact they may in fact reflect a reduced capacity of the individual in terms of emotion regulation in circumstances when experiencing high levels of stress (Becker et al., 2012). Without appropriate support, this behavioural dysfunction can lead to social exclusion and long-term psychosocial difficulties.

As expected, stress in children with ADHD not only affects the children themselves, but also their wider environment. Parents of children with ADHD often experience increased levels of parental stress, conflict and emotional exhaustion. This parental stress can create negative feedback loops in which increased reactivity or punitive discipline further undermines the child's ability to regulate stress. At the same time, children may internalize their parents' frustration, leading to reduced self-esteem and stronger feelings of inadequacy (Theule et al., 2013).

Social relationships are another area that is strongly affected by stress. Due to impulsivity and emotional reactivity, children with ADHD are more likely to experience peer rejection and bullying, which can be significant additional stressors. Social stress not only exacerbates existing symptoms, but can also increase the risk of long-term mental health problems, including social withdrawal and depression (Hoza, 2007).

If not addressed early, chronic stress can negatively impact the developmental trajectory of children with ADHD. Longitudinal studies have shown that early exposure to stress is associated with worse academic outcomes, substance use in adolescence, and persistent emotional and behavioural difficulties in adulthood (Wüstner et al., 2019). Furthermore, stress may play an important role in the development of comorbid conditions in ADHD, such as oppositional defiant disorder, conduct disorder and, in more severe cases, suicidality (Chronis-Tuscano et al, 2010). These findings highlight the need for early and targeted interventions that address not only the core symptoms of ADHD, but also reduce exposure to stress and enhance resilience through cognitive, behavioural and environmental strategies.

Emotional dysfunction, although not included in the formal diagnostic criteria for ADHD, is increasingly recognised as a central feature of the disorder, particularly in children. Studies have shown that children with ADHD exhibit more intense and more frequent emotional reactions, greater difficulty recovering from emotional distress, and increased sensitivity to negative stimuli (Shaw et al., 2016; Graziano & Garcia, 2016). These difficulties often become more pronounced under conditions of chronic stress, leading to disrupted peer relationships, academic challenges, and increased family conflict.

From a neurobiological perspective, emotional dysfunction in ADHD has been linked to dysfunctional connectivity between the prefrontal cortex and limbic regions such as the amygdala and insula (Bunford et al., 2015). These regions are also involved in key processes related to emotional intelligence, suggesting a common neurocognitive basis between ADHD and deficits in emotional intelligence. For this reason, the relationship between stress, emotional dysfunction and emotional intelligence becomes particularly important for understanding how individuals with ADHD cope with internal and external demands.

2.2. Emotional intelligence and ADHD

The concept of Emotional Intelligence (EI) has become increasingly important in understanding and supporting children with Attention Deficit Hyperactivity Disorder (ADHD). Although traditional models of ADHD focus primarily on deficits in attention and executive functioning, it is now recognised that emotional dysfunction often co-exists with ADHD (Martel, 2009; Graziano & Garcia, 2016). In addition to difficulties in attentional and behavioural concentration, many children and adolescents with ADHD are unable to control their emotions, have difficulty managing frustration, and experience difficulties in social interactions. Bakola & Drigas (2020) showed that deficits in SN often co-exist with ADHD symptoms, contributing to interpersonal difficulties and reduced self-esteem. This research also indicated that technological interventions targeting SN may be able to enhance self-awareness and emotional control in children with ADHD and autism, highlighting the potential for learning these skills. These findings support the view that addressing emotional intelligence is essential not only to improve social adjustment, but also to reduce vulnerability to anxiety in populations with ADHD.

Emotional intelligence is conceptualized through two dominant theoretical frameworks. The first is Mayer & Salovey's (1997) competency model, which frames EI as a set of measurable emotional and cognitive skills, including emotional

perception, emotional understanding and emotional management. The second is the trait model, often associated with Petrides et al. (2007), which views SN as a combination of behavioural dispositions and self-assessed emotion-related abilities.

In the context of ADHD, both models are quite similar. The ability to recognize emotional states, both in oneself and in others, is often compromised in children with ADHD, particularly in social situations that require constant attention and cognitive flexibility. At the same time, low SN traits, such as poor emotional self-efficacy and low emotional awareness, have been linked to more delinquent behaviors, such as aggression and impulsivity (Huber et al., 2019).

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2.3. Emotional intelligence as a protective factor

One of the most promising aspects of emotional intelligence is its protective role against stress. High EI in children is associated with greater emotional resilience, better coping strategies and lower cortisol reactivity in the face of social or academic stressors (Laborde et al., 2016). For children with ADHD, who often show increased reactivity to stress, improved emotional awareness and regulation may act protectively against the cognitive and behavioural effects of stress.

Recent studies have demonstrated that SN empowerment moderates the relationship between ADHD symptoms and internalizing problems such as anxiety and depression (Sevincok et al., 2020). More simply, children with ADHD and high levels of SN are less likely to develop emotional distress because of their symptoms. Similarly, training in emotion regulation has been found to improve task persistence, frustration tolerance, and self-efficacy in children with ADHD.

Furthermore, of interest is the related research by Drigas & Papoutsi (2020), who in the context of the COVID-19 pandemic, argued that training in emotional intelligence equips individuals to be able to cope more effectively with uncertainty, anxiety and emotional overload. This is particularly important in the case of ADHD, where increased reactivity to stress often makes cognitive and emotional impairments more pronounced. Through the cultivation of skills such as self-awareness, empathy and emotion regulation, emotional intelligence can mitigate the negative effects of anxiety and support adaptive coping. This information suggests that interventions aimed at enhancing emotional intelligence are not only beneficial for emotional development, but also serve as preventive measures against the effects of stress in individuals with ADHD.

Research consistently highlights the importance of SN in promoting resilience, social competence, and adaptive stress management (Mayer et al., 2008; Brackett et al., 2012). Among individuals with ADHD, lower SN has been linked to interpersonal conflict, reduced self-esteem, and increased vulnerability to stress (Ferrando et al., 2011). These findings suggest that SN deficits may exacerbate stress reactivity, while higher SN may buffer the negative effects of stress.

Indeed, intervention studies support this interpretation. School-based SN programs have improved emotional regulation, empathy, and cooperative behavior, with cascading effects on students' academic achievement and well-being (Brackett et al., 2012; Bauminger-Zviely et al., 2013). Particularly for individuals with ADHD, these programs offer a way to enhance self-regulation skills and mitigate social rejection.

The practical implications of these findings suggest that emotional intelligence should be considered a central goal of ADHD interventions. In times of crisis, such as the COVID-19 pandemic, emotional intelligence training has been shown to mitigate anxiety and enhance adaptive coping, highlighting its role in developing resilience (Drigas & Papoutsi, 2020). For children and adolescents with ADHD, this finding is of paramount importance, as their increased reactivity to anxiety puts them at risk for emotional and social difficulties. Moreover, the nine-level SN model essentially provides a guiding instrument for systematic skill development, linking emotional intelligence to higher-order cognitive and social abilities (Drigas, Papoutsi, & Skianis, 2021; Drigas, Papoutsi, & Skianis, 2023). Incorporating this training into educational settings could equip students with ADHD not only to manage anxiety more effectively, but also to enhance

their interpersonal relationships and academic performance. In this way, SN interventions serve a dual purpose: on the one hand, to address the underlying vulnerabilities associated with ADHD and, on the other hand, to promote the capacities conducive to long-term adjustment.

The conclusion is that SN is not only a descriptive trait, but also a modifiable set of skills that can be cultivated through targeted education.

2.4. Interventions based on emotional intelligence

Given its importance, several interventions have been developed to enhance emotional intelligence in children with ADHD. These interventions are often based on social-emotional learning frameworks and cognitive-behavioural therapy principles, with the aim of teaching children how to recognise, label and regulate their emotions in real-life situations. One such program is the *Incredible Years* series, which includes emotion practice modules designed to improve emotional literacy and self-regulation in young children. Studies have shown that children with ADHD who participate in such programs experience reduced emotional instability, improved peer relationships, and increased classroom engagement (Webster-Stratton et al., 2019).

In addition, Drigas & Papoutsis (2018) introduced a multilevel model of emotional intelligence that emphasizes the progressive acquisition of emotional and meta-emotional skills, from basic emotional awareness to higher-order processes such as empathy and social responsibility. This framework was later extended to the nine-level pyramid model, which incorporates metacognitive and meta-emotional strategies for education and training (Drigas, Papoutsis, & Skianis, 2021; Drigas, Papoutsis, & Skianis, 2023). These models emphasize that emotional intelligence is not fixed, but can be developed and changed through structured intervention programs, including those that incorporate technology and digital tools.

Another promising approach is the Tuning Into Kids (TIK) intervention, which focuses on training parents to be able to respond empathetically to their children's emotions while modeling emotion regulation themselves. In randomized trials, TIK has shown positive effects on emotional competence and behavioral regulation in children with ADHD symptoms (Bølstad et al., 2021). These findings highlight the importance of including caregivers in EI interventions, particularly given that children learn emotion regulation through social interaction and co-regulation.

In addition, school-based programs such as "*RULER*" (Recognizing, Understanding, Labeling, Expressing and Regulating Emotions) have been successfully adapted to support children with neurodevelopmental problems. Research has shown that these programs not only enhance emotional skills, but also help reduce hyperactive behavior and inattention in classroom settings (Brackett et al., 2012).

Of course, the development of emotional intelligence should not be viewed as a stand-alone intervention, but primarily as an integral component of the overall treatment of ADHD. Drug therapies, although effective in reducing the core symptoms of ADHD, do not directly address deficits in emotional regulation. By combining medication with emotion-focused treatments, children are more likely to show gains in social competence, academic functioning, and psychological well-being (Al-Saad et al., 2021).

It is important to note at this point that interventions targeting emotional intelligence can also improve long-term outcomes. Children with ADHD and low SES are at greater risk for substance use, antisocial behaviour and academic disengagement in adolescence (Dekkers et al., 2020). Early intervention to develop emotional skills may therefore have developmental benefits that extend beyond symptom management.

Although research on emotional intelligence and ADHD is promising, it remains a relatively new field and has not expanded much. There is still variability in how SN is defined and measured, making it difficult to compare findings across studies. In addition, many intervention studies are based on self-report measures or teacher evaluations, which may be influenced by bias or the context in which they take place.

Future research should aim to incorporate longitudinal designs, multi-informant assessments, and biological markers (e.g., heart rate variability, cortisol levels) to more accurately monitor changes in emotional functioning over time. In addition, tailoring SN interventions to be culturally sensitive and developmentally appropriate for children with different presentations of ADHD (inattention vs. hyperactivity-impulsivity) will be important to optimize their impact.

In conclusion, emotional intelligence plays a prominent but unexplored role in the experience, management and treatment of ADHD. As mounting evidence supports the relationship between emotional dysfunction, stress, and ADHD

symptom severity, interventions that enhance emotional awareness, regulation, and resilience offer a valuable complement to traditional treatment approaches. Integrating emotional intelligence training into school curricula, parenting programs, and clinical settings can help children with ADHD not only regulate their behavior, but also thrive socially, emotionally, and academically.

3. Conclusions

This review highlights the close association that exists between stress, emotional dysregulation and ADHD, while also highlighting the important role that emotional intelligence plays in understanding and supporting individuals with the disorder. The literature suggests that children and adolescents with ADHD are often exposed to increased levels of stress and may experience greater difficulties in regulating emotional responses, coping with frustration, and adapting to daily social and academic demands. These difficulties not only affect their attention and behaviour, but extend to emotional balance, interpersonal functioning and overall psychological adjustment.

Within this context, emotional intelligence appears to be an important protective factor. The ability to recognise, understand and regulate emotions can help people with ADHD to respond more effectively to stressful situations, reduce emotional reactivity and enhance adaptive coping. In this sense, emotional intelligence is not just an additional psychological construct, but an important dimension of self-regulation that may partly explain differences in resilience, stress management and social functioning among individuals with ADHD.

Findings also suggest that emotional intelligence-based interventions may offer significant benefits in educational and therapeutic contexts. Programs that focus on emotional awareness, emotional regulation, empathy, and interpersonal skills can support children with ADHD to manage stress more effectively and improve their social and academic adjustment. At the same time, the literature suggests that such interventions are likely to be most effective when integrated into broader support frameworks rather than when implemented in isolation.

However, it is also necessary to highlight some limitations. Available studies differ in terms of methodological design, target population and outcome measures, making direct comparison difficult. Furthermore, although the findings are promising, more research is needed to clarify the long-term effects of emotional intelligence training and to identify the most effective forms of intervention for different developmental stages and educational or clinical settings.

In conclusion, the literature supports the view that emotional intelligence can play an important role in managing anxiety in individuals with ADHD. Enhancing emotional awareness, regulation, and adaptive coping can contribute not only to better emotional functioning, but also to improved resilience, interpersonal relationships, and daily adjustment. Future research should continue to explore the integration of emotional intelligence into integrated models of intervention for ADHD, with particular attention to long-term outcomes and practical applications in school and clinical settings.

Compliance with ethical standards

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Disclosure of conflict of interest

The Authors proclaim no conflict of interest.

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