

**Exploring the Overlap Between Mental Health, Neurodevelopmental
Characteristics and Trauma in Childhood and Adolescence.**

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Thesis Abstract

Background: Neurodevelopmental and mental health conditions are prevalent in children and adolescents, with ADHD affecting approximately 5% of children and adolescents, common mental health difficulties affecting 13.4% of individuals, and 25-31.1% of children and adolescents experiencing trauma. Children and adolescents with ADHD are more likely to develop common mental health difficulties and to experience trauma. Reasons for these comorbidities have been proposed including bidirectionality, and shared risk factors, underlying mechanisms, and symptomology.

Method: A systematic review and meta-analyses were conducted to investigate both the prevalence rates of trauma exposed in individuals with ADHD and the prevalence rates of ADHD in individuals who have been exposed to trauma. The relationship between symptoms of ADHD, depression and anxiety was explored in a transdiagnostic cross-sectional sample of children through mapping of items from measures commonly used in diagnosis onto diagnostic criteria for anxiety, ADHD and depression. An exploratory factor analysis revealed underlying factors. Cluster analysis was conducted to identify subgroups of children with similar profiles. Differences in characteristics between subgroups were analysed.

Results: The prevalence rates of trauma exposure in individuals with ADHD, and the prevalence rates of ADHD in individuals exposed to trauma, are higher than rates we would expect to see in the general population. There was also an association between ADHD, depression and anxiety due to the heterogeneity of symptomology within diagnoses and the overlap of symptomology between diagnoses.

Conclusions: We demonstrate that the co-occurrence of ADHD and common mental health conditions, and ADHD and trauma among children and adolescents is a substantial issue that warrants clinical and research attention. Recommendations for assessment and appropriate intervention that adhere to a person-centred transdiagnostic framework are discussed.

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CHAPTER ONE

Introduction to Thesis Portfolio

Introduction to the Thesis Portfolio

Attention Deficit Hyperactivity Disorder

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterised by difficulties with attention, hyperactivity, and impulsivity (American Psychiatric Association [APA], 2013). The global prevalence of ADHD in children and adolescents is estimated to be around 5% (National Institute for Health Care and Excellence [NICE], 2024). In Europe, the estimated prevalence rate of ADHD is suggested to be 2.9% (95% CI 1.2–6.9%) (Sacco et al., 2024). However, research suggests that the prevalence rate of ADHD has been increasing over the past twenty years (Holden et al., 2013; McCarthy et al., 2012). The difficulties in attention, hyperactivity, and impulsivity experienced by children and adolescents with ADHD can negatively impact individuals' self-esteem, social and emotional functioning, and overall quality of life (APA, 2013; Mazzone et al., 2013; Wehmeier et al., 2010). ADHD has also been reported as a risk factor for the development of other psychiatric disorders and clinically salient outcomes including non-suicidal self-injury, difficulties in education, criminality, substance misuse, and relationship difficulties (Balazs et al., 2018; Biederman et al., 2014; Nourredine et al., 2022; Shaw et al., 2012; Willoughby, 2003).

Common Mental Health Disorders in Children and Adolescents

Adolescence is marked by biological, cognitive, and social changes that are associated with an increased risk of mental health difficulties (Blakemore & Mills, 2014; Kessler et al., 2005; Tamnes et al., 2017). The prevalence of mental health difficulties increases from childhood to adolescence and peaks during late adolescence (Costello et al., 2011; Dahl, 2004; Murphy & Fonagy, 2012). Mental health disorders are disturbances in an individual's cognition, behaviour and emotional regulation that cause severe impairment in daily functioning (World Health Organisation [WHO], 2022; American Psychiatric Association [APA], 2013). Polanczyk and colleagues (2015) estimated that the worldwide pooled prevalence of mental disorders in children and adolescents is 13.4% (CI 95% 11.3–15.9). The estimated world prevalence of any anxiety disorder was 6.5% (CI 95% 4.7–9.1), while any depressive disorder was 2.6% (CI 95% 1.7–3.9). Sacco and colleagues (2024) estimated that in Europe, one in five young people suffer from a mental health disorder, with a pooled prevalence rate of 15.5%. Anxiety disorders had the highest pooled prevalence rate (7.9% [95% CI 5.1–

11.8]), with depressive disorders having an estimated prevalence rate of 1.7% (95% CI 1.0–2.9%). Anxiety is defined as excessive worry and apprehension, which can lead to feelings of restlessness, fatigue, difficulties with concentration, irritability, muscle tension, and sleep disturbances (APA, 2013). Depression is characterized by persistent feelings of sadness and hopelessness, a loss of interest in activities, negative impacts on individuals' cognition and motivation, physical health difficulties such as increased fatigue, weight loss, lack of appetite, and sleep disturbances, and suicidal ideation (APA, 2013). Both anxiety and depression can result in substantial functional impairment in children and adolescents (Wu et al., 2015).

Trauma

Traumatic events are defined as events where an individual experiences an actual or perceived threat to their being or if an individual witnessed such events happening to others (APA, 2013). Common examples of childhood trauma may include child abuse (physical, emotional, and/or sexual), neglect, life-threatening accidents and illnesses, loss of a parent, natural disasters, exposure to community violence, and exposure to domestic violence. Research by Felitti and colleagues (1998) explains further that a traumatic experience is a distressing subjective experience alongside maladaptive psychological processing of these experiences. They define these experiences as an Adverse Childhood Experience (ACE). Exposure to adverse and possibly traumatic events has been suggested as a predictor of adverse outcomes such as poor physical and mental health (Belik et al., 2007; Kalmakis & Chandler, 2014; Keyes et al., 2013; Gerber et al., 2018; Ullman & Siegel, 1996). The prevalence of experiencing a traumatic event is suggested to be around 47% of people who experienced at least one ACE, with 9% of the population having 4+ ACES (Bellis et al., 2014). Other research suggests that this prevalence rate could be even higher, with the rate of individuals being exposed to trauma at least once in a lifetime being as high as 70% (Benjet et al., 2016).

Exposure to trauma-related experiences can result in individuals experiencing longer-term debilitating psychological reactions, including post-traumatic stress disorder (PTSD) (Alisic et al., 2014; McLaughlin et al., 2013). PTSD and trauma-related symptoms can be categorized by intrusive thoughts, avoidance, mood and cognitive change, arousal, emotional dysregulation, and dissociation (APA, 2013). Complex PTSD is an addition to the ICD-11 in which individuals have experienced multiple or prolonged trauma exposure (World Health Organization, 2022). Complex

PTSD has a population prevalence rate of 1-8% and is categorised by PTSD symptoms with more significant difficulties with emotional regulation, interpersonal difficulties, difficulties with self-identity, and disturbances in self-organization (Maercker et al., 2022). Although the recent version of DSM-5 does not endorse a Complex PTSD diagnosis, there has been a broader definition of trauma to include criteria relating to the negative impact of trauma on mood, cognition, affect disturbance, and self-perception (APA, 2013). Both PTSD and Complex PTSD have been shown to negatively impact individuals' development, learning, memory, and quality of life (Cloitre et al., 2014; Haselgruber et al., 2020; Samuelson et al., 2010).

Comorbidity

Neurodevelopmental and mental health conditions in children and adolescents are comorbid (Busch et al., 2002; Boulton et al., 2023; Hansen et al., 2018; Ogundele & Morton, 2022; Reale et al., 2017). Anxiety is seen as one of the most common mental health disorders in children and adolescents with ADHD (de la Barra et al., 2013; Jarrett & Ollendick, 2008; Yüce et al., 2013). It has also been indicated that depression and ADHD have an association (Blackman et al., 2005; Meinzer et al., 2014). There are increased negative impacts for the comorbidity of ADHD alongside a mental health difficulty, with greater difficulties in social development and academic achievement, further psychiatric difficulties, and a higher rate of suicide attempts (Biederman et al., 2008; Blackman et al., 2005; Daviss, 2008; Rydell et al., 2017). The comorbid nature of ADHD and trauma exposure has also been explored (Biederman et al., 2013; Craig et al., 2020; Cuffe et al., 1994; Weinstein et al., 2000; Zarei et al., 2021). The suggested reasons for these associations include bi-directional relationships, similar risk factors, shared symptoms, shared underlying mechanisms, and an overlap in diagnostic conceptualisation (Brady & Kendall, 1992; Jarrett & Ollendick, 2008; Langevin et al., 2023; Meinzer et al., 2014; Michelini et al., 2015; Murray et al., 2022; Seligman & Ollendick, 1998; Spencer et al., 2016; Szymanski et al., 2011; Wehmeier et al., 2010).

Traditional Diagnostic Models

Traditional diagnostic models involved in clinical psychology research and practice rely on category-based distinct diagnoses to help us understand and support individuals (Kendler, 2009). The main diagnostic models used in psychology currently include the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; American Psychiatric Association, 2013) and the International Classification of

Diseases (11th ed.; ICD-11, World Health Organisation, 2022). These manuals describe distinct psychiatric diagnoses associated with a distinct set of signs and symptoms. For example, diagnostic criteria for ADHD include difficulties with sustained attention, hyperactivity, and impulsivity (APA, 2013). These category-based approaches have provided a pragmatic way to understand and support individuals who present with difficulties (APA, 2013; Riegler et al., 2013). However, research has indicated that there may be limitations to the traditional diagnostic system. These limitations include symptoms often occurring across diagnoses (Coghill & Sonuga-Barke, 2012; Faraone et al., 1998; Kessler et al., 2005; Willcutt & Pennington, 2000) and the highly heterogeneous presentation of symptoms within each diagnosis (Luo et al., 2019; Musliner et al., 2016; Nelemans et al., 2014; Rommelse et al., 2011; Willcutt & Pennington, 2000). Other challenges include racial and socio-economic disparities in who gets a diagnosis (Evans-Lacko et al., 2018; Halvorsrud et al., 2019; Murali & Oyeboode, 2004; Schwartz & Blankenship, 2014). Another challenge to the traditional diagnostic model is that individuals who may present with difficulties impacting their day-to-day lives but, do not meet all the criteria to gain a diagnosis, are underrepresented in the research literature and do not always receive support (Coghill & Sonuga-Barke, 2012). The failure to gain an appropriate conceptualisation and understanding of diagnosis and difficulties that individuals experience, can influence the interventions offered to individuals, leading to possible inappropriate and ineffective intervention and management strategies, which could result in adverse outcomes.

Transdiagnostic Models

Transdiagnostic models move away from the diagnostic approach that focuses on distinct categories and instead focuses on the causes of the symptoms and characteristics themselves. Transdiagnostic approaches identify how symptoms group together in the real world. Firstly, transdiagnostic models endorse dimensional approaches, recognising the importance of continuous factors that span the full range of functioning without cut-off points to reach a diagnosis (Caspi et al., 2014; Caspi & Moffitt, 2018; Lahey et al., 2012, 2017; Martel et al., 2017; Patalay et al., 2015). Transdiagnostic dimensional models also conceptualize psychopathology as multiple hierarchically organized transdiagnostic dimensions (Dalglish et al., 2020). Advantages of transdiagnostic models include the understanding of difficulties and resulting interventions being tailored to an individual's needs rather than being based on singular and potentially inaccurate diagnostic labels (Newby et al., 2015; Weisz et al.,

2012). Theoretical and practical implications may include the mitigation of assigning multiple diagnoses, better understanding of the overlap and differentiation between and within diagnoses, inclusivity of all individuals who may require support irrespective of diagnosis, capturing the complexity of individuals, and improving person-centred care (Dalglish et al., 2020; Ehrenreich-May & Chu, 2013). Overall, transdiagnostic models may help to improve our understanding of mental health and neurodevelopmental difficulties.

Transdiagnostic dimensional approaches have been endorsed in relation to both mental health difficulties (Cuthbert & Insel, 2013; Doherty & Owen, 2014) and neurodevelopmental conditions (Astle et al., 2022; Holmes et al., 2019; Holmes et al., 2021; Sonuga-Barke et al., 2016; Zhao & Castellanos, 2016). There are limited studies that have investigated data-driven transdiagnostic models in relation to both mental health and neurodevelopmental symptomology (Akkermans et al., 2019; Holmes et al., 2021; Jacobs et al., 2021; Kuo et al., 2020; McKenney et al., 2023; Parkes et al., 2021). Further research into transdiagnostic models encompassing both mental health and neurodevelopmental difficulties may provide a promising alternative to diagnostic approaches. However, there is a limited research base, and to date, transdiagnostic approaches have not provided a paradigm shift that has impacted classification and clinical care (Fusar-Poli et al., 2019). This highlights the importance of continuing to contribute to research exploring transdiagnostic models.

Clinical Implications

Research suggests mental health disorders have been increasing with a steep rise in mental health referrals for anxiety, depression, sleep disorders, suicidal behaviour, stress-related disorders, attention deficit hyperactivity disorder (ADHD), Autism Spectrum Conditions (ASC), and other mental health problems (Blanchflower et al., 2024; Piao et al., 2022). By 2026, it is estimated that the number of people in England who experience a mental health problem will increase by 14.2%, resulting in a 45% increase in cost, estimated at £32.6 billion (McCrone et al., 2008). More recent figures show the costs of mental health care calculated at £300 billion a year in 2022 (Cardoso & McHayle, 2024). It has been suggested that the increase in mental health disorders can be attributed to social and economic factors, lack of access to mental health services, increased awareness and decreased stigma, and environmental factors, including climate change and political instability (Blanchflower et al., 2024; MIND, 2024; Piao et al., 2022; Wang et al., 2023). The Covid-19 pandemic has also been

indicated in the increase in mental health disorders in children and adolescents (Madigan et al., 2023; WHO, 2022). Another factor that has been suggested is the conceptualisation of mental health diagnoses, leading to an increase in understanding and development of diagnostic labels whereby categories are broader and more inclusive, allowing for more subjectivity in diagnosis (Goodman & Poillion, 1992). Subjectivity in understanding and labelling difficulties can lead to misdiagnosis, leading to inappropriate treatment planning, continuing individuals' need to access mental healthcare (Bradford et al., 2023). The increase in mental health disorders, alongside the other factors discussed, has impacted on mental health services in the United Kingdom (UK) experiencing significant challenges. These challenges include increased demand, long waiting times, lack of inpatient services, and lack of funding and resources (Henshaw, 2024).

Influenced by the growing pressures, the conceptualisation of mental health diagnosis, and the current service delivery model, mental health services can be fragmented, with different boundaries on thresholds for referrals, often leaving individuals with co-occurring needs, or those below thresholds, unsupported (Ogundele & Morton, 2022). It has been especially noted that there are barriers for individuals with neurodevelopmental conditions to access mental health care (Adams & Young, 2021; Baweja et al., 2021). Comorbid individuals tend to access more mental health services, report more suicide attempts, have less social stability, experience difficulties with education and employment, report lower quality of life, report greater impairment, and experience physical health difficulties (Karlsson et al., 2006; Lewinshon et al., 1995; Newman et al., 1998). Therefore, the understanding of appropriate conceptualisation of diagnoses and the relationships between diagnoses has important clinical implications.

Summary

Neurodevelopmental and mental health conditions are prevalent in children and adolescent populations, with ADHD affecting around 5% of the child and adolescent population and common mental health disorders affecting 13.4% of children and adolescents (NICE, 2024; Polanczyk et al., 2015). The lifetime prevalence of trauma can be as high as 70% worldwide (Benjet et al., 2016). Research suggests there are associations between ADHD and common mental health disorders, as well as an association with traumatic experiences (Craig et al., 2020; Jarrett & Ollendick, 2008; Meinzer et al., 2014). Limitations of traditional models of diagnosis include symptoms often occurring across diagnoses and heterogeneity within diagnoses (Coghill &

Sonuga-Barke, 2012; Faraone et al., 1998; Kessler et al., 2006; Luo et al., 2019; Musliner et al., 2016; Nelemans et al., 2014). Due to research and services being based on traditional diagnostic categories, individuals who present with difficulties impacting on their day-to-day lives, but do not meet all the criteria to gain a diagnosis, may be left without support (Ogundele & Morton, 2022). Transdiagnostic models may provide a framework to mitigate these limitations and provide understanding and support that more effectively meets the needs of individuals in real-world settings (Dalglish et al., 2020). However, despite growing interest, the evidence supporting transdiagnostic models is still emerging, and they have not yet led to transformative changes in classification systems or clinical care (Fusar-Poli et al., 2019).

CHAPTER TWO

Systematic Review and Meta-Analysis

Prepared for submission to Development and Psychopathology

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**A Systematic Review and Meta-Analysis on the Prevalence of ADHD and Trauma
in Children and Adolescents**

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Correspondence: TBC.

Short Title: Trauma and ADHD Overlap in Children and Adolescents

Abstract

Background: Attention Deficit Hyperactivity Disorder (ADHD) and trauma-related disorders are reported as being highly comorbid in children and adolescents.

Objectives: This meta-analysis aimed to establish the prevalence of trauma exposure among children and adolescents with ADHD, *and* the prevalence of ADHD among young people exposed to trauma.

Methods: Two random effect meta-analyses were conducted. Moderation analyses explored the impact of trauma type (interpersonal violence [IPV] vs non-interpersonal violence [non-IPV], and individual vs collective) and study quality on prevalence rates.

Results: Among 83,350 children and adolescents ($k = 36$ studies) exposed to trauma, the pooled ADHD prevalence rate was 23.48% (95% CI 16.97, 30.58). Rates were not significantly affected by trauma type (IPV vs. non-IPV) but were significantly lower in studies with lower risk of bias. Limited data prevented moderator analysis of trauma type (collective vs. individual). Among 45,518 children and adolescents ($k = 37$ studies) with ADHD, the pooled trauma exposure rate was 35.01% (95% CI 26.14, 44.44). Study quality didn't significantly affect prevalence, and limited information prevented analysis of trauma type moderation.

Conclusions: These results indicate the co-occurrence of trauma exposure and ADHD in children and adolescents is higher than the prevalence of each separately in the general population.

Keywords: ADHD, Trauma, Children, Adolescents, meta-analysis

A Systematic Review and Meta-Analysis on the Prevalence of ADHD and Trauma in Children and Adolescents

Attention Deficit Hyperactivity Disorder (ADHD) is a neurodevelopmental condition characterised by elevated levels of inattention, and/or hyperactivity, and impulsivity (American Psychiatric Association [APA], 2013). The global prevalence of ADHD in children and adolescents is estimated to be around 5% (National Institute for Health Care and Excellence [NICE], 2024), and research suggests it is increasing year on year (Holden et al., 2013; McCarthy et al., 2012). Elevated levels of inattention, hyperactivity, and impulsivity experienced by children and adolescents diagnosed with ADHD can negatively impact self-esteem, social and emotional functioning, and overall quality of life (APA, 2013; Mazzone et al., 2013; Wehmeier et al., 2010).

Traumatic events are defined as events where an individual experiences an actual or perceived threat to their being or witnesses such events happening to others (APA, 2013). Common examples of childhood trauma include child abuse (physical, emotional, and/or sexual), neglect, life-threatening accidents and illnesses, loss of a parent, natural disasters, exposure to community violence, and exposure to domestic violence. Certain traumatic experiences in childhood accompanied by maladaptive psychological processing have been termed Adverse Childhood Experiences (ACE; Felitti et al., 1998) including household dysfunction (e.g. parental mental illness, substance misuse, incarceration, or divorce) alongside abuse and neglect. Estimates of a single trauma exposure or experiencing one ACE range from 47% (Bellis et al., 2014) to 70% (Benjet et al., 2016), with nine percent of the population having experienced more than four ACEs (Bellis et al., 2014).

Exposure to adversity and trauma is associated with poor physical and mental health (Belik et al., 2007; Kalmakis & Chandler, 2015; Keyes et al., 2013; Gerber et al., 2018; Ullman & Siegel, 1996) and can result in longer-term debilitating psychological reactions, including post-traumatic stress disorder (PTSD) (Alisic et al., 2014; McLaughlin et al., 2013) – a condition categorized by intrusive thoughts, avoidance, changes in mood and cognition, increased arousal, emotional dysregulation, and dissociation (APA, 2013). Multiple or prolonged trauma is classified by ICD-11 (World Health Organization [WHO], 2022) as complex PTSD (note, this is not endorsed by DSM-5 [APA, 2013], but the DSM definition of trauma has been broadened to include criteria relating to the negative impact of trauma on mood, cognition, affect disturbance, and self-perception). Defined by greater difficulties with emotional regulation,

interpersonal difficulties, difficulties with self-identity, and disturbances in self-organization, complex PTSD is estimated to affect 1-8% of the population (Maercker et al., 2022). PTSD and Complex PTSD can negatively impact development, learning, memory, and quality of life (Cloitre et al., 2014; Haselgruber et al., 2020; Samuelson et al., 2010).

It is well documented that ADHD and trauma exposure are highly comorbid (Biederman et al., 2013; Craig et al., 2020; Cuffe et al., 1994; Weinstein et al., 2000; Zarei et al., 2021). Research suggests there are several reasons why this may be the case. One explanation is that trauma exposure and ADHD have a bi-directional relationship, with one predisposing the development (and severity) of the other (Ford & Connor, 2009; Lugo-Candelas et al., 2021; Szymanski et al., 2011; Spencer et al., 2016; Unver et al., 2019; Weinstein et al., 2000). Trauma exposure may exacerbate the symptoms of ADHD, such as inattention and a loss of impulse control (Briscoe-Smith & Hinshaw, 2006; Craig et al., 2020; Khamis, 2006; Langevin et al., 2023; Weinstein et al., 2000; Zhang et al., 2022), and difficulties including inattention, interpersonal difficulties and behavioural regulation that are common in ADHD may increase risk of trauma exposure (Biederman et al., 2014; Brown et al., 2017; Ma et al., 2016; Ohlsson Gotby et al., 2018).

Another explanation is that threat-related trauma might cause changes in neural structures and neurobiological imbalances that are consistent with ADHD. For example, differences in network connectivity in the medial temporal, prefrontal cortices, and limbic areas, as well as dopamine imbalances, that are associated with threat are also seen in ADHD (Anda et al., 2006; Calem et al., 2017; Chang et al., 2020; Dahoun et al., 2019; del Campo et al., 2011; Koss & Gunnar, 2018; McLaughlin et al., 2013).

A final explanation is an overlap in symptom presentations and diagnostic criteria between ADHD and trauma causing diagnostic confusion, increasing not only the risk of misdiagnosis but also the chances of receiving both diagnoses (Spencer et al., 2016; Szymanski et al., 2011). Individuals who have experienced trauma may present with hypervigilance – focussing on certain stimuli, disregarding contextual elements and other details, and using avoidance strategies – which may be mistaken for characteristics of inattention associated with ADHD, such as distractibility and forgetfulness (Boodoo et al., 2022; Szymanski et al., 2011; Weinstein et al., 2000). Dissociation experienced through flashbacks, amnesia, depersonalisation, or derealisation following trauma might also be mistaken for inattention (Boodoo et al.,

2022), while arousal that affects irritability and sleep and increases reckless or self-destructive behaviours mimic the hyperactive/ impulsive characteristics of ADHD (APA, 2013; Boodoo et al., 2022; Weinstein et al., 2000). Features of ADHD, such as avoiding cognitively demanding tasks, may also be confused with avoidance techniques and lack of interest seen following trauma (Boodoo et al., 2022). It is also to be noted that the DSM-5 allows for several different symptoms of ADHD to be present to meet the threshold for diagnosis, similarly, several trauma-related symptoms are required to meet the threshold for diagnosis of PTSD (APA, 2013). This can lead to individuals who are diagnosed with ADHD or PTSD with a diverse range of symptomology (Barkley, 1990; Weinstein et al., 2000). Another factor to consider is the increased breadth of each diagnostic category (e.g., more symptoms) has increased subjectivity in clinical diagnostic processes (Goodman & Poillion, 1992). These factors contribute to the diagnostic overlap between ADHD and trauma.

Current study

The aim of this meta-analysis was to establish the prevalence of diagnosed ADHD among trauma-exposed children and adolescents, and to establish the prevalence of trauma exposure in children and adolescents diagnosed with ADHD.

Previous systematic reviews on ADHD and trauma have inconsistently addressed prevalence, often prioritising associations or risk estimates over population-level burden. For example, Craig et al. (2020) found bidirectional links between ADHD and maltreatment (e.g., exacerbated impulsivity and emotional dysregulation) but lacked consistent prevalence data. Similarly, Spencer et al. (2016) reported reciprocal risk between ADHD and PTSD, but focused on likelihood ratios, limiting estimates of population burden.

Other reviews have focused on a narrow definition of trauma. Langevin et al. (2023) linked child sexual abuse to later ADHD diagnosis, supporting longitudinal evidence of trauma's neurodevelopmental impact (Danese et al., 2020; McLaughlin et al., 2020), while Zhang et al. (2022) found that multiple ACE's intensified ADHD symptoms, particularly in females and complex family contexts. However, both relied on narrow trauma categories and odds ratios, limiting generalisability. Broader trauma definitions are crucial, as varied trauma types can produce similar symptom profiles (Spencer et al., 2016; Jae, 2024).

The current review offers a novel contribution by focusing on prevalence rates, with broader definitions of trauma, to better estimate the population-level burden of ADHD among trauma-exposed individuals and vice versa. This inclusive approach captures underrepresented trauma profiles and co-occurring cases below clinical thresholds, offering clearer comparisons and informing trauma-informed care and service planning (McDonald & Ejesi, 2021; Brooks & Greenberg, 2024).

Another key innovation is the inclusion of the full adolescent period, now defined up to age 25 (Sawyer et al., 2018), in recognition of continued neurodevelopment. Prior reviews often excluded emerging adults, despite evidence of ongoing brain maturation, particularly in regions linked to executive functioning, and shared mechanisms between trauma and ADHD (Calem et al., 2017; McLaughlin et al., 2013). Expanding the age range supports more accurate understanding of comorbidity during this developmental period, informing more responsive public health strategies.

The current review helps to provide a broad definition of trauma to explore its prevalence among children and adolescents with a diagnosis of ADHD and vice versa, to explore the prevalence of ADHD in young people who have experienced trauma, covering the whole adolescent period. We conceptualised trauma as including childhood adversity and maltreatment, witnessing a traumatic event, or living through a traumatic event (e.g. war, natural disaster). We also explored whether trauma-type - individual versus collective trauma, and interpersonal violence (IPV) vs non-interpersonal violence (non-IPV) – moderated prevalence rates. Risk of bias was also explored.

Method

The study protocol was pre-registered on the Prospective Register of Systematic Reviews (PROSPERO; CRD42024518391). A systematic search of three electronic literature databases (MEDLINE, PsycINFO, and Published International Literature on Traumatic Stress [PILOTS]) was conducted.

The search terms were: *Attention Deficit Disorder with Hyperactivity* OR *Attention Deficit Disorder* OR *attention deficit hyperactivity disorder* OR *hyperkinetic disorder* OR *hyperkinetic syndrome* OR *ADHD* AND *posttraumatic stress disorder* OR *complex PTSD* OR *natural disasters* OR *child neglect* OR *child abuse* OR *sexual abuse* OR *emotional abuse* OR *verbal abuse* OR *physical abuse* OR *domestic violence* OR *abandonment* OR *Trauma* OR *war* OR *post traumatic stress disorder* OR *PTSD* AND *young people* OR *young person* OR *Youth** OR *Child** OR *adolescent** OR *adolescence*

OR *teenager** OR *teen** OR *youngster** OR *children**. Where appropriate, searches were also run using medical search headings (MeSH terms).

Searches were restricted to those published between 1994 (when the DSM-IV was published) and 3rd April 2024. Use of the DSM-IV and later editions reflects alignment with current diagnostic frameworks for trauma and ADHD. Their definitions, such as core PTSD symptom clusters (intrusion, avoidance, hyperarousal) and the three ADHD subtypes, continue to inform current clinical practice, making them relevant and generalisable to current populations. Please note that another search will be completed prior to publication.

Study selection

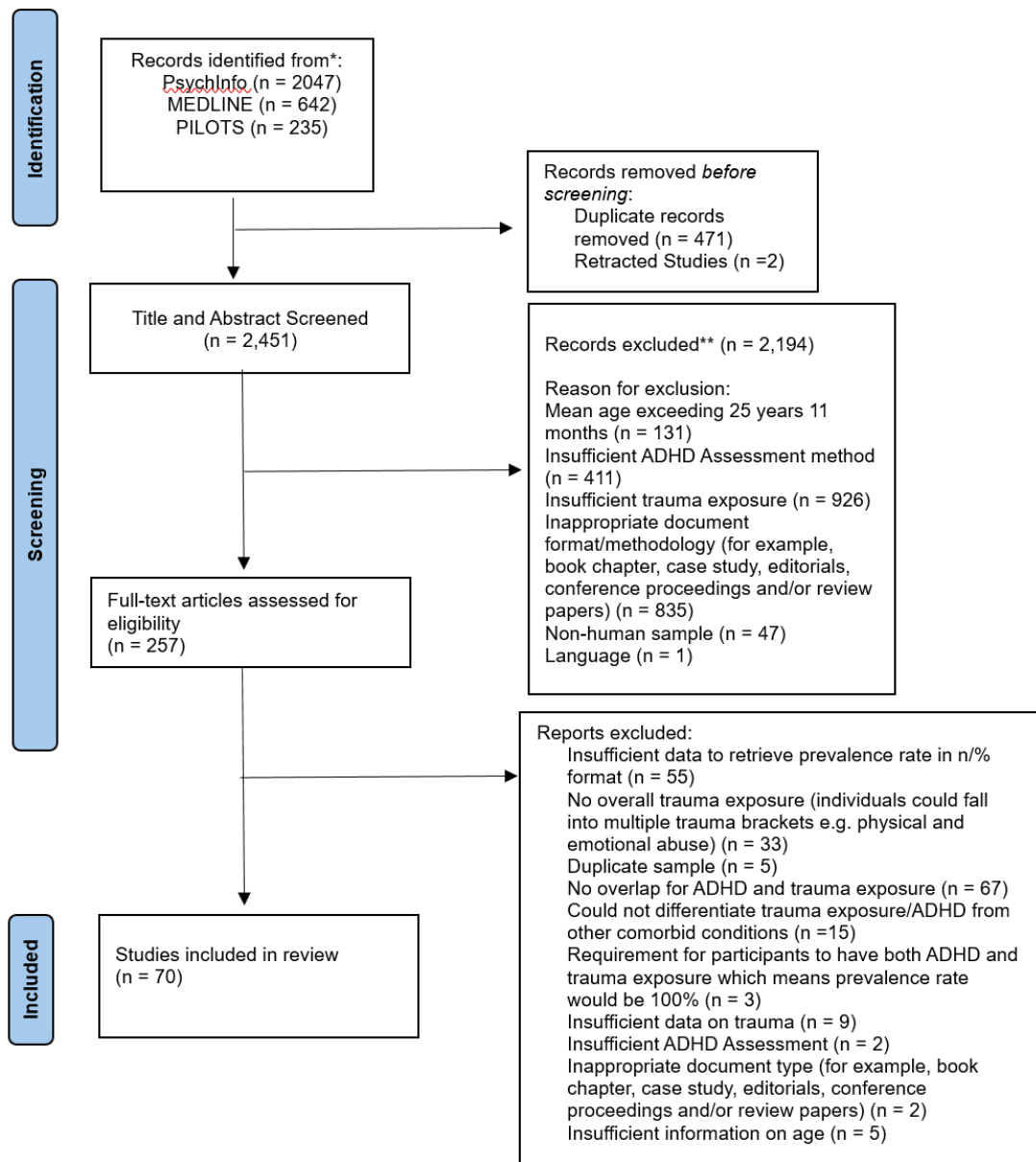
Studies meeting the following inclusion criteria were selected: 1) Published in a peer-reviewed journal with full-text availability, or doctoral theses and dissertations. Systematic reviews and meta-analyses were not included but were consulted to ensure all relevant studies were included in the current analysis. 2) The article had to be published in English, or accessible in English. 3) Used one of the following study designs: randomised controlled trial (RCTs), longitudinal, case controlled, individual differences, correlational, or experimental. 4) The mean age of the participants was between 0 and 25 years and 11 months to ensure the entire adolescent period was covered (Sawyer et al., 2018). 5) The study reported the number or percentage of children and adolescents with diagnosed ADHD and trauma exposure, providing adequate information to derive the prevalence rate of ADHD solely for individuals exposed to trauma or the rate of trauma exposure in a group with an ADHD-only diagnosis (i.e., studies reporting trauma exposure for ADHD groups with comorbid conditions were excluded unless trauma exposure was reported separately for those with ADHD-only). 6) Study participants defined as trauma-exposed must either have been exposed to trauma as defined by criteria for PTSD in either DSM-IV or DSM-5, or as determined by study authors. 7) Study participants defined as having ADHD must have a diagnosis of ADHD received through a clinical interview conducted by a clinically trained individual or have been included in the study on the basis of having a diagnosis of ADHD.

Study Screening and Data Extraction

Evidence for Policy and Practice Information (EPPI) -Reviewer 6 (Thomas et al., 2023) was used for study screening and data extraction. See Figure 1 for Preferred Reporting Items for Systematic Reviews and Meta Analysis (PRISMA) flow diagram.

Figure 1.

PRISMA Flow Chart



Titles were screened by EB, and duplicates were removed. Titles and abstracts were screened for a total of 2,451 studies by three researchers (AD, HJ, EM), with each

researcher screening an equal number of studies and every study being screened by two reviewers. Any differences in opinion were resolved through consultation with the two senior researchers, JH and EB. Full-text screening was completed for 275 studies by AD, HJ, and EM. Differences of opinion were resolved through consultation with JH and EB.

AD completed data extraction for 70 studies that met the inclusion criteria following screening. The following data were extracted: a) Publication details (Author, title, year of publication), b) study design, c) sample characteristics (age range, mean age, age standard deviation, gender, country of publication) d) trauma type (broad description of trauma, e.g. hurricane or earthquake, whether trauma was collective or individual, whether trauma involved interpersonal violence, e) diagnostic approach (measure used, measure type as either interview or self-report), f) outcome data (number individuals in the overall sample, number of identified individuals with ADHD, number of identified individuals with trauma exposure, number of individuals with comorbid ADHD and trauma exposure, ADHD diagnostic approach, trauma diagnostic approach). A summary of the key characteristics of the 70 included studies is provided in Table 1. Of these, 33 studies reported trauma exposure data for an ADHD group, 34 studies reported ADHD prevalence data for individuals exposed to trauma, and three studies reported both sets of information.

Table 1*Study Characteristics*

Study	Main Sample Population	N (Primary Sample)	N (Sub Sample)	Age in Years Range/ M (SD)	Country	Trauma Type	Trauma Measure	ADHD Diagnosis	IPV/N on-IPV**	Collective/ Individual Trauma	Risk of Bias
Abraham (2002)	ADHD	530	54	8-17	United States	PTSD	Chart Review	Chart Review	NR	NR	6
Aytaclar et al. (1999)	Trauma	106	20	11.59 (0.96)	United States	Fathers with Substance Abuse Diagnosis	Chart Review	K-SADS-PL	Non-IPV	Individual	6
Balázs et al. (2018)	ADHD	52	9	14.87 (1.38)	Hungary	PTSD	Mini-Kid	Mini-Kid	NR	NR	7
Bauer et al. (2022)	Trauma	1594	78	0-11	Brazil	IPV and Non-IPV	DAWBA	DAWBA	Both	Individual	7
Biederman et al. (2013)	ADHD	271	14	10.5 (3.4)	United States	PTSD (3 car accidents, 3 witnessed abuse, 5 sexual abuse /rape, and 3 physical abuse)	SCID	SCID	Both	Individual	6
Biederman et al. (2014)	Trauma	237	168	12.2 (3.8)	United States	PTSD	K-SADS-E	K-SADS-E	NR	NR	6
Biederman et al. (2018)	Trauma	105	6	15.42 (1.98)	South Africa	Childhood Sexual Abuse and PTSD	K-SADS-PL	K-SADS-PL	IPV	Individual	7
Björkenstam et al. (2018)	ADHD	10634	6333	16.84 (1.15)	Sweden	ACE	NR	Chart Review	Both	Both	6
Briscoe-Smith et al. (2006)	ADHD	40	20	9.67 (1.68)	United States	Physical Abuse, Neglect, Sexual Abuse, Domestic Violence	Chart Review	CBCL, SNAP, DISC-IV	IPV	Individual	7
Brown et al. (2017)	ADHD	6708	4689	4-17	United States	ACE	Questionnaire	Chart Review	Both	Both	8
Cengel-Kültür et al. (2007)	Trauma	54	12	NR	Turkey	Sexual Abuse, Physical Abuse, Emotional Abuse, Potentially Traumatic Experience	Chart Review	Chart Review	IPV	Individual	6
Clark et al. (2023)	Trauma	1152	294	15.6	United States	Potentially Traumatic Experience	CAPS-CA-5	Mini-Kid	NR	NR	7
Cohen et al. (2002)	Trauma	97	29	15	United States	Physical Abuse	K-SADS-E	K-SADS-E	IPV	Individual	7

Connor et al. (2013)	Trauma	19	17	11.9 (1.5)	United States	Physical Abuse, Witnessing Violence Towards Others, Death of a Relative, or “Other” (bullying, motor vehicle accident, illness)	UCLA Reaction Index	Chart Review	Both	Individual	8
Copeland et al. (2018)	Trauma	1007	63	0-30	United States	Violent Trauma, Sexual Trauma, Witnessing a Trauma, or Learning About a Traumatic Event Occurring to a Loved One, and Other Traumas	CAPA	CAPA	Both	Individual	8
Crouch et al. (2021)	ADHD	4039	2601	0-17	United States	ACE	Questionnaire	Chart Review	Both	Both	7
Croyle (2014)	ADHD	138	66	10.42 (2.9)	United States	Earthquake, Disaster, Bad Accident, War, Physical Abuse, Domestic Violence, Neighbourhood Violence, Assault, Sexual Abuse, Death of a Loved One.	UCLA Reaction Index	Chart Review	Both	Both	6
Dalgin-Cohen (2023)	ADHD	30	22	14-18	United States	Divorce, Separation, or Death Leading to Single Parenting, Physical or Emotional Abuse, Death of a Family Member	Chart Review	Chart Review	Both	Individual	5
Daud & Rydelius (2009)	ADHD	22	17	12.1 (2.1)	Sweden	Parents Tortured	DICA, PTSS-C	DICA, SDQ	IPV	Individual	7
Dawes et al. (1997)	ADHD	180	39	11.25(0. 99)	United States	Fathers with Substance Abuse Diagnosis	CEDAR	K-SADS-PL	Non- IPV	Individual	6
Davanzo et al. (2018)	ADHD	61	40	15.9 (2.06)	Chile	ACE	Questionnaire	Chart Review	Both	Both	5
De Bellis (2015)	Trauma	73	43	10.3 (2.6)	United States	Maltreatment and PTSD	K-SADS-PL	K-SADS-PL	IPV	Individual	10

De Sanctis et al. (2014)	ADHD	98	61	21.6 (2.2)	United States	Childhood Maltreatment (emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect).	CTQ	DISC, CBCL, Conners	IPV	Individual	5
Dykman et al. (1997)	Trauma	109	47	9.33 (1.75)	United States	Sexual Abuse, Physical Abuse	Interview	DICA, CBCL	IPV	Individual	6
Edinburgh et al. (2006)	Trauma	290	44	10-14.99	United States	Sexual Abuse	Interview	Chart Review	IPV	Individual	5
Elklit et al. (2023)	ADHD	13919	1179	0-17	Denmark	Exposed to Violence	Chart Review	Chart Review	NR	NR	7
Endo et al. (2006)	Trauma	39	26	10.7(0.6)	Japan	Abused Children	Chart Review	Chart Review	IPV	Individual	6
Famularo et al. (1996)	Trauma	117	28	8.08	United States	Significant Child Abuse	Chart Review	DICA	IPV	Individual	7
Findik et al. (2021)	Trauma	91	33	9	Turkey	Refugee Status	NR	Interview	NR	Collective	4
Flisher et al. (1997)	Trauma	172	5	13.1	United States/ Puerto Rico	Physical Abuse	Interview	DISC	IPV	Individual	7
Ford (1999)	ADHD	50	32	11.5 (3.4)	United States	Accident/ Injury/ Illness, Victimization	TESI-C/TSI-P	SNAP	Both	Individual	7
Glod & Teicher (1996)	Trauma	19	4	9.5 (2.3)	United States	Sexual Abuse, Physical Abuse	Chart Review	Interview	IPV	Individual	7
Gomes et al. (2019)	Both	169	35 (ADHD) 25 (Trauma)	22	Brazil	PTSD	MINI-Kid	MINI-Kid	NR	NR	7
Guendelman et al. (2016)	ADHD	140	32	9.6 (1.7)	United States	Childhood maltreatment	Chart Review	Chart Review	IPV	Individual	6
Hadianfard (2014)	ADHD	30	16	7-12	Iran	Mild/Moderate Abuse	CASRS	Chart Review	IPV	Individual	7
Halkett et al. (2022)	ADHD	140	35	25.6	United States	Childhood Sexual Abuse	Chart Review	DISC, SNAP	IPV	Individual	8
Harnish (2007)	ADHD	137	99	10.4	United States	Abuse	Chart Review	Interview, Conners	IPV	Individual	5

Harris et al. (2017)	ADHD	368	37	0-10	United States	Abuse, Domestic Violence	Chart Review	Chart Review	IPV	Individual	5
Hinshaw (2002)	ADHD	140	20	9.5 (1.68)	United States	Sexual Abuse, Physical Abuse	Chart Review	DISC, SNAP, CBCL	IPV	Individual	5
Kelly & Li (2019)	Trauma	921	188	0-17	United States	Toxic Stress	Questionnaire	Chart Review	Both	Individual	6
Khamis (2006)	ADHD	345	58	12-16	Palestine	Physical Abuse	CPMS	Interview	IPV	Individual	7
Koponen et al. (2023)	Trauma	615	76	15-24	Finland	Mothers with Substance Abuse Diagnosis	AUDIT	Chart Review	Non-IPV	Individual	4
Kousha et al. (2013)	Trauma	84	22	0-18	Iran	PTSD	K-SADS	K-SADS	NR	NR	8
Lin et al. (2023)	ADHD	3540	42	7.21 (5.94)	Taiwan	Physical Abuse, Emotional Abuse, Sexual Abuse, Neglect	NR	Chart Review	IPV	Individual	4
Llorens et al. (2022)	ADHD	76	34	15.9 (0.8)	Spain	Childhood Maltreatment	CTQ	Chart Review	IPV	Individual	7
Lugo-Candelas et al. (2021)	ADHD	213	192	5-15	United States/ Puerto Rico	ACE	Interview	DISC	Both	Both	8
Ma et al. (2016)	ADHD	44	15	8.57	China	Child Maltreatment by Parent	Interview	Chart Review	IPV	Individual	5
Milberger et al. (1999)	Trauma	289	189	16	United States	Parental Substance Abuse	Interview	K-SADS	Non-IPV	Individual	6
Moss et al. (1995)	Trauma	34	8	10.84 (0.94)	United States	Fathers with Substance Abuse Diagnosis	SCID	K-SADS	Non-IPV	Individual	6
Okwori (2022)	ADHD	2677	1627	3-17	United States	ACE	Interview	Chart Review	Both	Both	6
Park et al. (2016)	ADHD	54	29	9.2 (2.89)	Korea	Physical Abuse, Emotional Abuse, Sexual Abuse, and General Traumatic Experiences	ETISR-SF	K-SADS-PL	Both	NR	8
Park et al. (2024)	Trauma	41	11	14.61 (2.71)	Korea	Domestic Violence, Bullying, Sexual Abuse, Suicide-Related, Traffic Accident, Other	K-CRTES-R	NR	Both	Individual	5

Ruhl et al. (2009)	ADHD	64	5	18-24	Germany	PTSD	F-DIPS	F-DIPS	NR	NR	10
Scheeringa & Zeanah (2008)	Trauma	70	17	5.1	United States	Hurricane	Disaster Experiences Questionnaire	Chart Review	Non-IPV	Collective	6
Schilpzand (2018)	ADHD	179	48	7.3 (0.4)	Australia	Natural Disaster, Threat of Death/Injury, Attacked, Sexual Abuse, Threatened with Weapon, Bad Accident, Witness Death or Dead Body	DISC-IV	DISC-IV	Both	Both	7
Shirfrin (2014)	ADHD	32	1	13.93 (2.51)	United States	PTSD	HCATP Questionnaire	Chart Review	NR	NR	5
Smalley et al. (2007)	ADHD	188	18	16-18	United States	PTSD	K-SADS-PL	K-SADS-PL, SWAN	NR	NR	6
Staller (2007)	Both	ADHD 8 Trauma 5	Trauma 2 ADHD 2	4-5	United States	PTSD	Chart Review	Chart Review	NR	NR	3
Steiman & Watemberg (2015)	Trauma	132	15	9.6 (9.4)	Israel	Potentially Life Threatening Event	Chart Review	Chart Review	Non-IPV	Individual	5
Taillieu et al. (2021)	Trauma	561	25	0-5	Canada	Intimate Partner Violence (Parental)	Family First Screening Questionnaire	Chart Review	IPV	Individual	8
Ünver & Karakaya (2019)	Trauma	68	15	13.07	Turkey	PTSD	Interview	Interview	NR	NR	6
Van Dyk et al. (2015)	ADHD	50	27	8.76	South Africa	Divorce or Separation of Parents, Family Members with Mental Illness, Family Alcoholism or Substance Abuse, Witnessing of Death, Death of a Pet, Death of a Sibling, Parent or Grandparent, Serious Injury or Violence to Others, Serious Injury or Illness of Sibling, Motor Vehicle Accident and Natural Disaster	Interview	NA	Both	Both	6

Walker et al. (2021)	Trauma	17473	2144	10 (4.3)	United States	ACE	Questionnaire	Chart Review	Both	Both	8
Walrath et al. (2003)	Trauma	759	132	11.6 (3.4)	United States	Sexual Abuse	Questionnaire	Chart Review	IPV	Individual	5
Westphal (2012)	Trauma	90	1	13.4 (2.89)	United States	Trauma Exposure with/without PTSD	Interview	DICA	NR	NR	7
Whitlock (2008)	Both	ADHD 24 Trauma 8	Trauma 9 ADHD 2	10.1 (1.77)	Canada	Life Threatening Event	TSCC	Chart Review, Conners, BASC	Both	Both	6
Wong et al. (2022)	Trauma	7473	350	8.57 (4.69)	China	Childhood Maltreatment	Chart Review	Chart Review	IPV	Individual	8
Wozniak et al. (1999)	ADHD	182	15	12.3 (3.1)	United States	Physical Attack, Threat with Weapon, Sexual Abuse, Physical Abuse, Accident, Witness, Combat, Medical Catastrophe, PTSD	NR	K-SADS-E	Both	Individual	5
Zarei et al. (2021)	Trauma	49057	7634	0-5	United States	ACE	Questionnaire	Chart Review	Both	Both	8
Zwicker (2020)	Trauma	220	68	13.5 (4.4)	Canada	Childhood Maltreatment and Bullying	JVQ, CECA	Interview	IPV	Individual	6

Risk of Bias Analysis

AD completed a risk of bias check to assess the quality of the included studies using a tool developed for prevalence studies by Hoy and colleagues (2012). 25% of the studies were also screened by another researcher (HM) to check for reliability. Each study was measured against 10 criteria assessing: i) the representativeness of the general population, ii) the representativeness of the population in question, iii) the selection process for the recruitment of participants, iv) non-response bias (e.g. what was the response rate for the study, if the response rate was below 75%, was there an analysis of demographic differences between responders and non-responders), v) the methodology of data collection, vi) the acceptability of case definition, vii) the reliability and validity of the instruments used, viii) the mode of data collection, ix) length of prevalence period, and x) appropriate numerator(s) and denominator(s). Each criterion that was met was scored 1, with an overall total of 0-10, with higher scores indicating a lower risk of bias. Scores of 7-10 indicated low risk of bias, 4-6 moderate risk of bias, and 0-3 high risk of bias.

Statistical Analysis

Analyses were conducted in R (v4.4.2: R Core Team, 2024) using the ‘metafor’ (Viechtbauer, 2010) and ‘dplyr’ (Wickham et al., 2023) packages. Random effects models were run to calculate weighted estimates of both the prevalence of ADHD in individuals exposed to trauma, and the prevalence of trauma exposure in individuals with diagnosed ADHD, on the basis that the studies would contain substantial heterogeneity. Prevalence estimates, confidence intervals, and prediction intervals were calculated for each analysis. Proportion estimates were subjected to an arcsine transformation to stabilise variances prior to the meta-analyses (Barendregt et al., 2013; Schwarzer et al., 2019), and reverse transformed for reporting here. Cochran’s Q and I² were used to assess heterogeneity (Cochran, 1954; Higgins & Thompson, 2002).

Moderation analyses, planned a priori, were conducted to explore whether trauma type (individual vs collective trauma, or interpersonal violence (IPV) vs non-

interpersonal violence) affected prevalence rates. We also evaluated whether prevalence rates were affected by study quality by entering the risk of bias, categorised as low, moderate, or high risk, into a moderation analysis. In some cases, moderation analyses were not possible due to limited data (e.g., no studies reporting non-IPV trauma exposure for diagnosed ADHD groups). In these cases, subgroup analysis was conducted to establish prevalence rates. These analyses should be interpreted with caution.

Results

Included studies

Table 1 summarises the 70 included studies, published from 1996 to 2024. There were 129,018 participants across all studies, ranging from $n = 55$ to $n = 49,057$ per study, with an age range of 0-30 years. The studies were conducted in 21 countries, with the majority of the studies being conducted in the United States ($k = 40$).

ADHD diagnoses were established differently across the 70 studies. For 29 studies, participants were only included if they had an existing diagnosis of ADHD as determined by a clinical assessment against IC11 or DSM5 criteria and/or recorded on the participant's medical record. A further 38 studies included individuals who were assessed clinically for ADHD as part of the study recruitment via validated structured interviews conducted by clinicians or the research team who were trained by clinicians. Two studies included individuals with ADHD as established via a chart review of education health and care plans conducted by the authors of the study. Two studies stated that individuals were diagnosed with ADHD via DSM 5 criteria but did not elaborate on the method of diagnosis.

Different types of trauma exposure were reported across the included studies, including interpersonal violence (IPV; $k = 27$), non-IPV ($k = 7$), mixed IPV/non-IPV trauma ($k = 22$), not specified ($k = 14$). Studies also reported whether individuals had experienced individual trauma incidents ($k = 42$), collective trauma incidents ($k = 2$), or

both individual/collective trauma ($k = 12$). Fourteen studies did not report trauma type in relation to individual based or collective based trauma incidents.

Risk of Bias Assessment

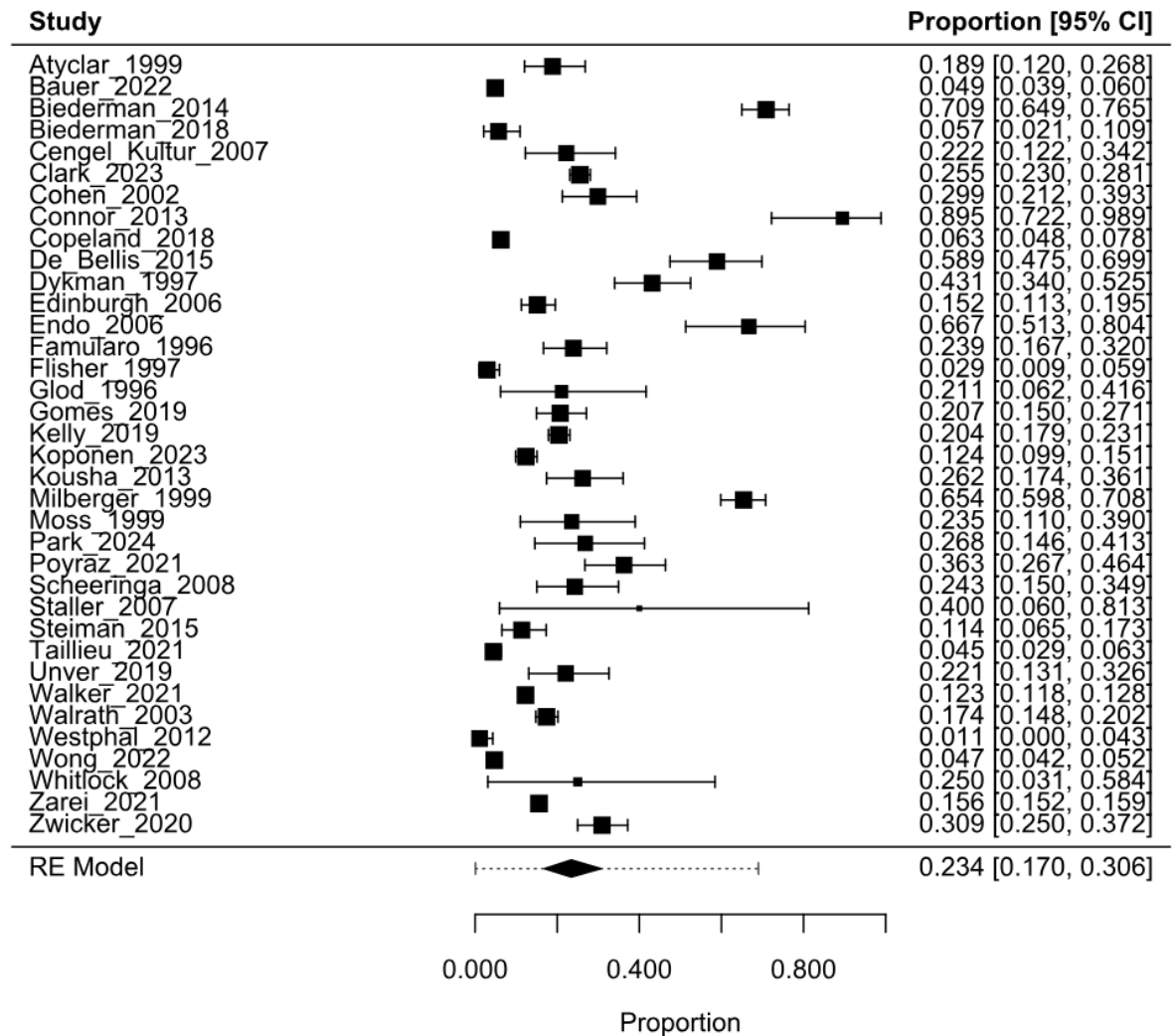
Of the 70 included studies, 32 were rated as low risk of bias, 37 as medium risk, and one as high risk using the Hoy et al. (2012) risk of bias tool. High-risk studies may limit generalisability and distort prevalence estimates. Therefore, a moderation analysis is essential to assess potential bias.

Prevalence of diagnosed ADHD in trauma-exposed children and adolescents

36 studies were included, with a total of $n = 83,350$ participants across all studies. The pooled prevalence estimate of having an ADHD diagnosis among trauma-exposed children and adolescents was 23.43% (95% CI 16.97, 30.58). The Q statistic was significant, $Q(df = 35) = 2521.0536, p < .0001$, indicating considerable heterogeneity between studies ($I^2 = 99.69\%$; prediction interval 0.0009-0.6902). See Figure 2 for the forest plot.

Figure 2

Forest Plot Showing ADHD Prevalence Rates Among Children and Adolescents Exposed to Trauma.



Moderator analysis for ADHD prevalence among children and adolescents exposed to trauma

A moderation analysis revealed that trauma type (IPV vs non-IPV) did not affect the pooled incidence estimate of ADHD in trauma-exposed young people. As shown in Table 2 below, the ADHD prevalence rate in individuals who had experienced IPV was 21.81% (95% CI 12.4, 33.01), calculated across 14 studies with a total of $n=10,088$

participants. ADHD prevalence rates were slightly higher among individuals who had experienced non-IPV trauma of ADHD (24.72%; 95% CI 11.06, 41.66 established across six studies with a total of $n = 1,246$ participants), but IPV vs non-IPV trauma did not have significant effect on ADHD prevalence overall, $QM(df = 1) = 0.0893$, $p = 0.7650$, with significant heterogeneity across studies $Q(df = 18) = 914.6744$, $p = < .000$, $I^2 = 98.43\%$. This suggests that the type of trauma exposure (IPV vs. non-IPV) does not affect ADHD prevalence rates.

Table 2

Moderation Analysis of Trauma Type in Relation to ADHD Prevalence Among Children and Adolescents Exposed to Trauma

Predictor	<i>k</i>	<i>n</i>	Prevalence (%)	95% CI	<i>QM</i>	<i>df</i>	<i>p</i>
IPV trauma	14	10,088	21.81	[12.40, 33.01]	0.0893	1	0.7650
Non-IPV Trauma	6	1,246	24.72	[11.06, 41.66]			

There were insufficient data to complete moderation analyses to explore whether trauma type (collective vs individual trauma) affected the prevalence of ADHD among children and adolescents exposed to trauma.

Risk of bias for ADHD prevalence among trauma-exposed children and adolescents

Studies were categorised as low, moderate, or high for risk of bias. A total of 16 studies were rated as having a low risk of bias ($n = 79,262$ participants), 19 as having a moderate risk of bias ($n = 4083$ participants), and only one as having a high risk of bias ($n = 5$ participants). The ADHD prevalence rates among trauma-exposed children and

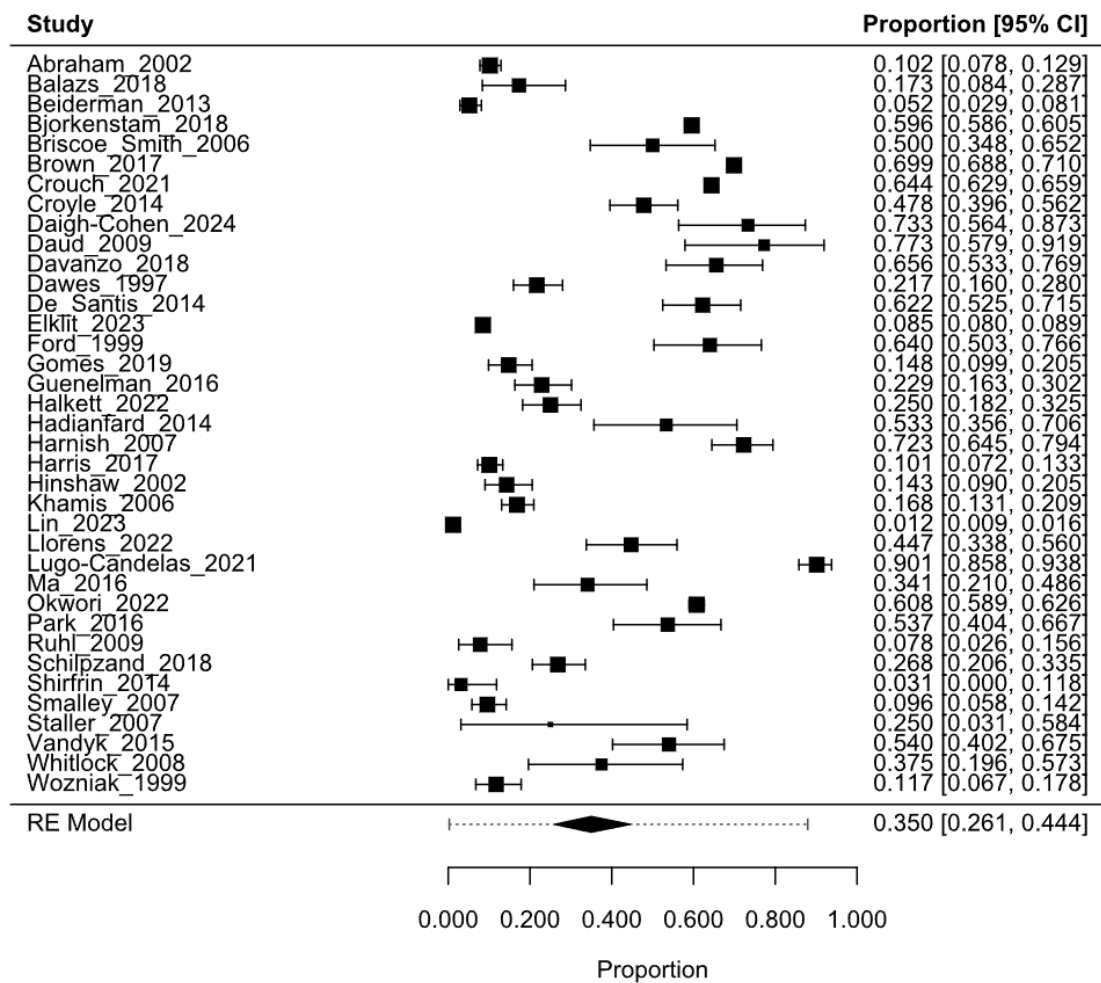
adolescents differed by the quality of the study (low risk of bias = 17.16% (CI 95% 8.76, 27.67), moderate risk of bias = 29.69% (CI 95% 21.33, 38.80), and high risk of bias = 40.00% (CI 95% 5.95, 81.25). Overall, ADHD rates were lower in studies rated as being higher quality, and the moderation effect was significant, $QM(df = 1) = 3.9820$, $p = 0.0460$ with significant heterogeneity across studies, $Q(df = 34) = 2160.4633$, $p < .0001$, $I^2 = 99.66\%$. However, the data needs to be interpreted with extreme caution due to there being only one study rated as having a high risk of bias.

Prevalence of trauma exposure in children and adolescents with ADHD

Across 37 eligible studies, with a total of $n = 45,518$ participants, the pooled prevalence of trauma exposure among children and adolescents with diagnosed ADHD was 35.01% (95% CI 26.14, 44.44). There was considerable heterogeneity between studies, $Q(df = 36) = 19875.8308$, $p < .0001$, $I^2 = 99.72\%$; prediction interval = 0.0025-0.8795. See Figure 3 for the forest plot.

Figure 3

Forest Plot Showing Prevalence of Trauma Exposure Among Children and Adolescents with ADHD.



Moderator analysis for prevalence of trauma exposure in children and adolescents with diagnosed ADHD

There were insufficient data to complete moderation analyses to explore whether trauma type (IPV vs non-IPV, and collective vs individual trauma) affected the prevalence of trauma exposure among children and adolescents with diagnosed ADHD. There were no studies reporting non-IPV or collective trauma exposure in groups of

children and adolescents with ADHD. For this reason, subgroup analyses were run to establish estimates of IPV and individual trauma exposure in those with ADHD.

A subgroup analysis, which included 21 studies and a total of $n = 25,624$ participants, revealed the prevalence of IPV trauma exposure among children and adolescents with ADHD was 31.81% (CI 95% 17.66, 47.95), with significant heterogeneity across studies, $QE(df = 12) = 11041.3824$, $p = < .0001$, $I^2 = 99.79\%$. A second subgroup analysis, including 19 studies and a total of $n = 4878$ participants, revealed the prevalence of individual trauma exposure among children and adolescents with ADHD was 29.35% (CI 95% 15.95, 44.89), with significant heterogeneity across studies, $QE(df = 13) = 11100.0135$, $p = < .0001$, $I^2 = 99.78\%$.

Risk of bias for prevalence of trauma exposure in children and adolescents with diagnosed ADHD

A total of 16 studies were deemed to have low risk of bias ($n = 26,100$), 20 with moderate risk of bias ($n = 19,410$), and one high risk of bias ($n = 8$). The prevalence of trauma exposure among children and adolescents with ADHD was higher in better quality studies (low risk of bias = 41.40% [CI 95% 27.62, 55.91], moderate = 30.49% [CI 95% 19.11, 43.24], high = 25% [CI 95% 3.10, 58.43]), but the moderating effect of risk of bias was not significant, $QM(df = 1) = 1.3969$, $p = 0.2372$), with significant heterogeneity across studies $QE(df = 35) = 19469.1045$, $p = .0001$, $I^2 = 99.65\%$). However, the data needs to be interpreted with extreme caution due to there being only one study rated as having a high risk of bias.

Publication Bias

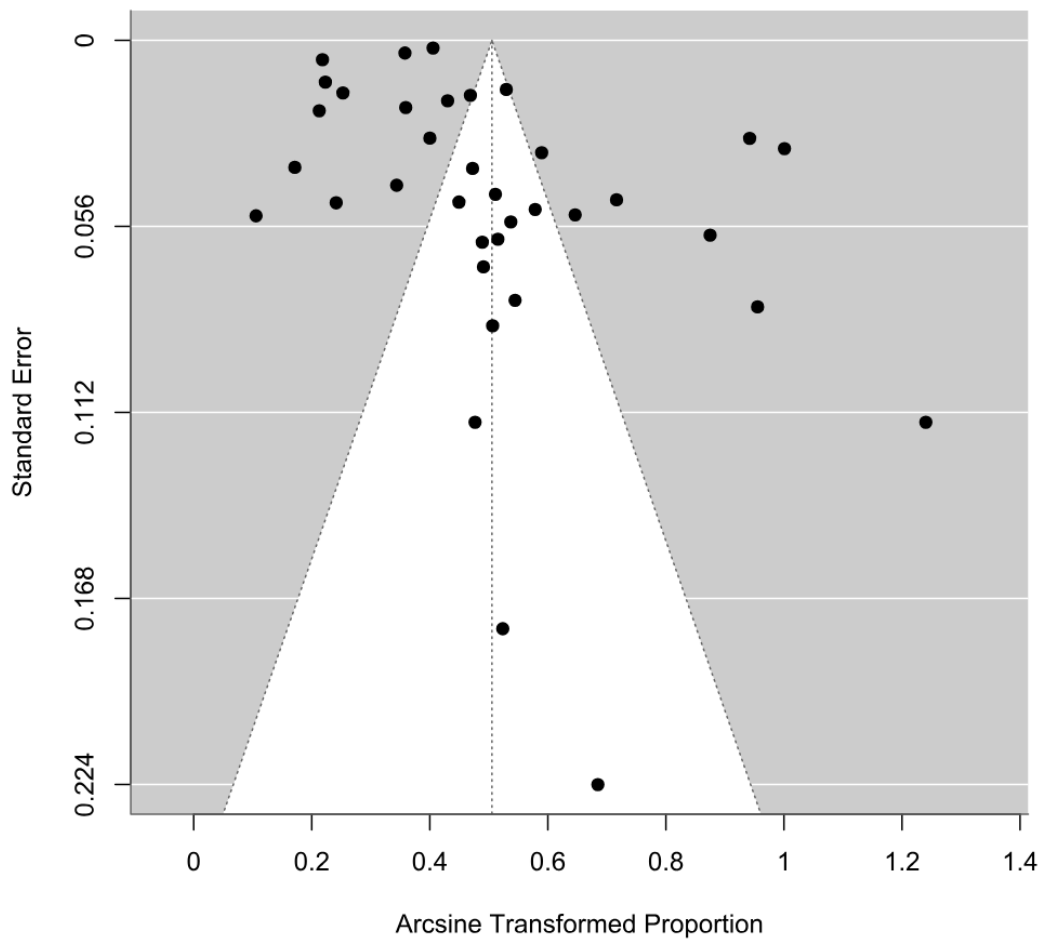
Visual inspection of a funnel plot was used to assess for publication bias, and an Egger's regression test was run for each of the meta-analyses, followed by a trim and fill analysis (Duval & Tweedle, 2000; Egger et al., 1997; Higgins & Altman, 2008).

Visual inspection of the funnel plot revealed some asymmetry for the meta-analysis exploring the prevalence of ADHD among trauma-exposed children and adolescents, with studies grouping in the top left corner (Figure 4). This suggests that

larger and/or more precise studies tend to report lower prevalence rates, consistent with the risk of bias analysis that indicated prevalence rates were lower in studies rated as better quality/having a lower risk of bias. The Egger's test confirmed there was publication bias, $z = 2.3111$, $df = 35$, $p = 0.0208$, but the trim and fill analysis indicated there were no missing studies on the left side ($SE = 3.3405$).

Figure 4

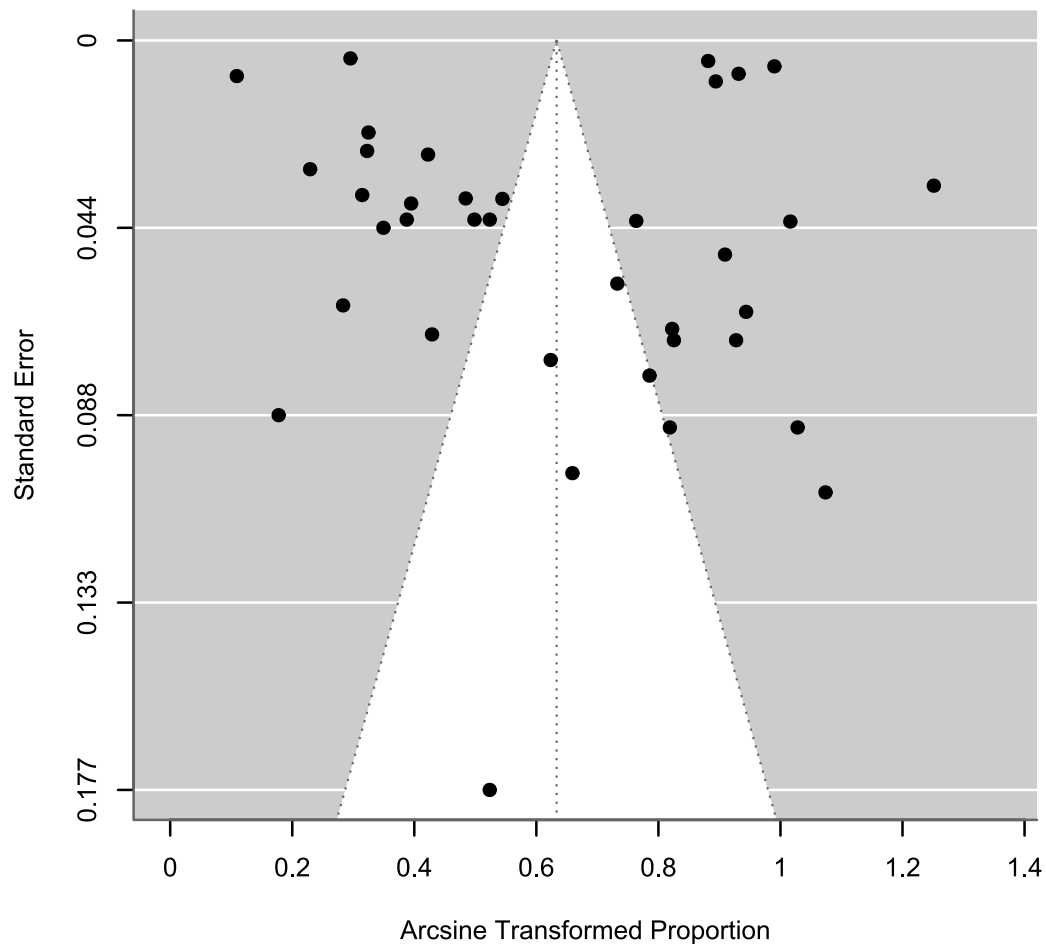
Funnel Plot of Publication Bias Analysis for Individuals with ADHD in a Trauma Exposed Sample.



Visual inspection of the funnel plot for studies reporting the prevalence of trauma exposure among children and adolescents with diagnosed ADHD had a good level of symmetry (see Figure 5), the Egger's test showed there was no publication bias, $z = 0.8671$, $df = 36$, $p = 0.39$), and the trim and fill analysis identified no missing studies on the left side ($SE = 3.63$). These outcomes are consistent with the risk of bias analysis that suggested the quality of the studies/level of risk of bias did not affect the prevalence of trauma exposure among those with ADHD.

Figure 5

Funnel Plot of Publication Bias Analysis for Individuals Exposed to Trauma in individuals with ADHD.



Discussion

Attention deficit hyperactivity disorder (ADHD) and trauma exposure are often reported as being highly comorbid in childhood and adolescence (Craig et al., 2020; Cuffe et al., 1994; Langevin et al., 2023; Spencer et al., 2016; Weinstein et al., 2000; Zhang et al., 2022). To the best of our knowledge, there has not been an estimate of the prevalence rate of ADHD for young people who have experienced trauma, nor of the rate of trauma exposure for young people with diagnosed ADHD, that examines the

extent of their co-occurrence across the entire adolescent period (e.g., up to age 25, Sawyer et al., 2018), taking into account multiple types of trauma. Across two meta-analyses, we establish that almost a quarter of trauma-exposed youth will receive an ADHD diagnosis (23.43%), and that more than a third (35%) of children and adolescents with ADHD will have been exposed to trauma.

The prevalence of ADHD in children and adolescents in the general population is reported to be between 8 and 10% (NICE, 2024). The outcomes of our first meta-analysis establish that in children and adolescents who have been exposed to trauma, this prevalence rate is more than double (23.4%). Prevalence rates were not significantly affected by trauma type (IPV vs non-IPV), and collective vs individual trauma could not be explored in relation to moderation effects due to the low number of studies. Prevalence rates differed by study quality, with studies with a lower risk of bias reporting lower estimates (17.16%) than studies with a moderate (29.69%) or high risk of bias (40%). These data suggest that, conservatively, up to 17% of children exposed to trauma will receive an ADHD diagnosis.

The lifetime prevalence rate of trauma exposure in the general population is reported to be 70.4%, with 5.6% likely to develop PTSD (Kessler et al., 2017; Koenen et al., 2017). In children and adolescents, this prevalence rate is lower, ranging from 25% to 31.1% (Costello et al., 2002; Lewis et al., 2019). Our second meta-analysis suggests the prevalence of trauma exposure among those with an ADHD diagnosis is slightly elevated (35%) relative to general population estimates, although we included all of adolescents (up to age 25) and not just those aged 18 and under like previous studies. It was not possible to test whether trauma type affected these prevalence rates as no studies were included that reported non-IPV or collective trauma for children and adolescents with diagnosed ADHD. However, subgroup analyses revealed that 31.8% of those with ADHD will have been exposed to IPV trauma, and 29.35% will have experienced individual trauma. The prevalence of trauma exposure among youth with ADHD was not significantly affected by the quality of the study, as shown by a risk of bias analysis, although higher rates tended to be reported in better quality studies.

Rates of ADHD diagnoses might be higher among trauma-exposed young people, and trauma exposure rates slightly higher among ADHD populations, relative to the general population estimates. These findings support research that suggests there is an association between ADHD and trauma exposure in children and adolescents (Biederman et al., 2013; Craig et al., 2020; Cuffe et al., 1994; Weinstein et al., 2000; Zarei et al., 2021). As explained previously, there are several reasons for the comorbidity observed in the current study. These include overlap in the diagnostic criteria and presentation of both conditions, which causes diagnostic confusion and increases the chances of a child being diagnosed with both conditions (Boodoo et al., 2022; Spencer et al., 2016; Szymanski et al., 2011; Weinstein et al., 2000), or similar effects of ADHD and trauma on neural, cognitive and behavioural development (Anda et al., 2006; Calem et al., 2017; Chang et al., 2020; Dahoun et al., 2019; del Campo et al., 2011; Koss & Gunnar, 2018; McLaughlin et al., 2015). ADHD and trauma also confer increased risk for each other. Harsh parenting, and interpersonal and behavioural regulation difficulties that are common in ADHD may increase the risk of trauma exposure (Anjum & Malik, 2010; Khamis, 2006; Ohlsson Gotby et al., 2018; Park et al., 2017), and trauma exposure may exacerbate the symptoms of ADHD (Craig et al., 2020; Langevin et al., 2023; Weinstein et al., 2000; Zhang et al., 2022).

Our data, which suggest rates of ADHD are much higher among trauma-exposed children and adolescents, support the idea that trauma exposure contributes to the development or exacerbation of ADHD presentations. However, it could also indicate a failure to consider trauma exposure when completing ADHD assessment, leading to diagnostic confusion and misdiagnosis. Although previous research and the findings of the current study suggest ADHD and PTSD are comorbid, it is important to note there has also been research that has failed to find a relationship between trauma exposure and ADHD (Ford et al., 2000; Wozniak et al., 1999). Szymanski et al. (2011) suggest that this may be due to the conceptualization of trauma used within the studies being too narrow.

Clinical Implications

The current study establishes that ADHD is common following trauma exposure, and that trauma is common among children and adolescents with ADHD. These findings carry important clinical implications.

First, it is vital for clinicians to consider the overlap between ADHD and trauma when conducting diagnostic assessments. When a young person presents with symptoms of either condition, clinicians need to assess for the other condition as it is possible that both may be present, or that one is presenting as the other (Cuffe et al., 1994; Ford et al., 2000; Harris et al., 2017; Schilpzand et al., 2018; Szymanski et al., 2011; Walker et al., 2021; Weinstein et al., 2000; Wozniak et al., 1999). For example, previous research has suggested that there may be overdiagnosis of ADHD or unidentified trauma-related symptoms when an individual's trauma history is not considered (Cuffe et al., 1994; Ford et al., 2000; Szymanski et al., 2011; Wozniak et al., 1999; Weinstein et al., 2000). Therefore, it is important to include an exploration of trauma-related experiences in an ADHD assessment. In order to differentiate the two diagnoses, several methods have been suggested, including creating a timeline for the development of symptoms, gaining an understanding of the individual's subjective thoughts or feelings in order to ascertain the motivation and purpose of the presenting behaviours, including situation exploration, and being curious about individual's overall presentation rather than being symptom-focused (Boodoo et al., 2022; Weinstein et al., 2000).

Second, the overlap between the conditions needs to be considered when treatment planning. Evidence-based interventions for ADHD and trauma-related disorders include both psychosocial and pharmacological management (NICE, 2018; NICE, 2019). When choosing treatment, clinicians should consider the potential benefit of treatment pathways for both conditions based on a young person's clinical presentation, social support, and available treatment options (Szymanski et al., 2011). Misdiagnosis may lead to inappropriate interventions and subsequent adverse side effects, including inappropriate medication, untreated trauma-related symptoms, and unhelpful environments (Connor et al., 2013; Weinstein et al., 2000). The comorbidity

observed in the current meta-analysis can also help to promote research into interventions that meet transdiagnostic difficulties. For example, social support can help to mitigate the impact of trauma exposure on the severity of ADHD symptomology (Okwori et al., 2022). Promising evidence also supports trauma-informed interventions, like trauma-focused CBT and EMDR, as effective in reducing both ADHD and trauma-related symptoms (Ahmadi et al., 2020; Clarke & Darker-Smith, 2024; Majeste, 2025; Schoorl et al., 2015).

Third, and finally, additional resources should be targeted towards the improvement of service delivery for interventions for individuals with ADHD following trauma exposure. Mental health and neurodevelopmental services are often separate, with neurodevelopmental pathways frequently limited to assessment only. This divide can lead to fragmented care for children with co-occurring conditions, placing coordination burdens on families (Ogundele & Morton, 2022; Ono et al., 2019). The findings highlight growing recognition of ADHD comorbidity with other mental health conditions (Biederman et al., 2013; Craig et al., 2020; Cuffe et al., 1994; Weinstein et al., 2000; Zarei et al., 2021), pointing to a need for integrated or expanded services tailored to co-occurring needs. Such models could reduce misdiagnosis, inappropriate treatment, and prevent individuals being left unsupported.

Limitations and Future Directions

The strengths of this review include its focus on the whole adolescent age range, inclusion of multiple trauma types, and the two meta-analyses that explore the overlap between ADHD and trauma from both angles – the prevalence of ADHD among trauma-exposed young people, and the prevalence of trauma exposure among young people with ADHD. It is limited by the low numbers of studies in some analyses (e.g., the low number of studies reporting collective trauma and non-IPV trauma), and by the high levels of heterogeneity present in each of the analyses. Although we explored several factors that could contribute towards heterogeneity via moderator analyses (trauma type and quality of study), there are likely other factors impacting on the prevalence of ADHD and trauma exposure which have not been accounted for in this

review. These include single vs multiple trauma, simple vs complex PTSD, and the severity and frequency of trauma-related and ADHD symptoms. Future meta-analyses should explore the impact of these factors on both heterogeneity and prevalence rates.

A key limitation of current meta-analyses is the inclusion of studies with unusually high or low prevalence rates, potentially distorting pooled estimates. For instance, Connor et al. (2013) reported an ADHD prevalence of 89.47% among trauma-exposed youth likely inflated due to a small, clinically complex, comorbid sample and a study design focused on treatment feasibility rather than accurate prevalence estimation. Several studies also reported confidence intervals entirely above the pooled mean, increasing heterogeneity and potential publication bias (Biederman et al., 2014; Endo et al., 2006; De Bellis et al., 2015; Dykman et al., 1997; Milberger et al., 1999). Elevated rates in these studies may reflect clinical or familial sampling, regional diagnostic differences, or variation in trauma type and assessment tools.

Similarly, in the meta-analysis of trauma exposure among youth with ADHD, high prevalence rates were observed in several studies (Bjorkenstam et al., 2018; Crouch et al., 2021; Daigh-Cohen et al., 2024; Daud et al., 2009; Davanzo et al., 2018; Ford et al., 1999; Harnish et al., 2007; Lugo-Candelas et al., 2021; Okwor et al., 2022). These studies were likely influenced by clinical sampling, stricter diagnostic criteria, or cultural reporting norms. Demographic and geographic factors, including refugee or socioeconomically disadvantaged samples (Bjorkenstam et al., 2018; Harnish et al., 2007), and methodological differences (e.g., cross-sectional vs. longitudinal designs; Davanzo et al., 2018; Ford et al., 1999), also contributed to heterogeneity.

These variations highlight the need to consider study context, design, population, and diagnostic criteria when interpreting pooled prevalence. While random-effects models weighted by sample size and a risk of bias analysis were used to reduce outlier influence while maintaining inclusivity, future research would benefit from additional subgroup or moderator analyses or outlier exclusion to enhance interpretability.

The inclusion criteria were designed to maximise coverage and generalisability while managing heterogeneity, but several limitations remain.

Age range was a key consideration, with the aim of capturing all children and adolescents affected by trauma and ADHD. However, Staller (2007) focused on children under five, a group vulnerable to diagnostic misclassification due to overlap with typical developmental behaviours (Angold & Egger, 2007; Gadow et al., 2001; Ford-Jones, 2015). Although NICE guidelines support age-adjusted diagnoses (NICE, 2018), diagnosis under age six remains controversial. While random-effects models helped account for variability, small samples increase bias, and future research should consider excluding very young samples or examining age as a moderator.

To improve internal validity, studies with comorbid conditions were excluded, which reduced heterogeneity but limited generalisability given ADHD's frequent co-occurrence with other neurodevelopmental disorders (Krauss & Schellenberg, 2022; Murray et al., 2021). Therefore, inclusion of comorbid neurodevelopmental conditions in future research may provide a more accurate prevalence rate reflecting the complexity seen in real world contexts.

Language restrictions also constrained generalisability; although excluding non-English studies reduced interpretation bias, it may have introduced language bias and obscured cultural differences in trauma and ADHD expression. Including non-English studies in future work would provide a more global perspective.

Theses and dissertations were incorporated to expand the evidence base and mitigate publication bias, but this raised potential concerns about study quality. A bias analysis was conducted to assess this, though limitations may persist.

Lastly, extracting only sample size and prevalence data (N/%) and using a broad trauma definition allowed for wider inclusion and enhanced generalisability, but also increased heterogeneity and may complicate interpretation of pooled prevalence estimates.

A final limitation is that citation chaining (e.g., forward citation tracking, reference screening) was not systematically used, potentially overlooking relevant studies not indexed by standard keywords or MeSH terms.

Conclusion

This study has demonstrated that the co-occurrence of trauma exposure and ADHD among children and adolescents is a substantial issue that warrants clinical and research attention.

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CHAPTER THREE

Bridging Chapter

Bridging Chapter

Chapter Introduction and Aims

Research into overlapping mental health diagnoses increasingly supports a transdiagnostic framework (Cuthbert & Insel, 2013; Doherty & Owen, 2014). More recently, this framework has been applied to neurodevelopmental conditions (Astle et al., 2022; Holmes et al., 2019, 2021; Sonuga-Barke et al., 2016; Zhao & Castellanos, 2016). However, limited work has examined transdiagnostic approaches that span both neurodevelopmental and mental health difficulties. Existing studies suggest transdiagnostic models may better reflect clinical realities than traditional diagnostic categories (Akkermans et al., 2019; Jacobs et al., 2021; Kuo et al., 2020). It is well-established that ADHD frequently co-occurs with anxiety and depression (Busch et al., 2002; Boulton et al., 2023; Hansen et al., 2018; Ogundele & Morton, 2022; Reale et al., 2017). To our knowledge, no studies have yet examined the association between ADHD, anxiety, and depression using a transdiagnostic framework that specifically addresses overlapping symptomatology as defined by DSM-5 criteria (APA, 2013).

One approach to explore the relationship between diagnoses, based on symptom overlap, is to complete data-driven clustering analysis, which groups individuals based on shared symptom profiles (Astle et al., 2019; Bathelt et al., 2021; Hirsch et al., 2019; Mareva et al., 2023). Under traditional diagnostic assumptions, we would expect distinct clusters aligned with specific diagnoses (e.g., anxiety, depression, ADHD). In contrast, a transdiagnostic model would predict more mixed profiles that cross diagnostic boundaries.

In summary, while transdiagnostic approaches are gaining traction, especially in mental health research, there is limited integration across neurodevelopmental and mental health domains. The present study aims to address this gap by mapping ADHD, anxiety, and depression characteristics in children and adolescents using exploratory, data-driven methods.

CHAPTER FOUR

Empirical Research Paper

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Exploring the Overlap of Symptoms of ADHD, Depression and Anxiety in Children and Adolescents.

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Declarations

Funding: The project was completed as part of AD's doctorate in Clinical Psychology at the University of East Anglia, which was funded by Cambridgeshire and Peterborough NHS Foundation Trust (CPFT). CPFT had no involvement in study design, data collection, analysis, writing or decision to submit for publication. The CALM study was funded by the Medical Research Council (MRC) and University of Cambridge, who reviewed and approved the study design and analysis.

Conflicts of interest/competing interests: The authors have no competing or potential conflicts of interest.

Availability of data and material: The CALM study is a managed Open Access cohort.

Code availability: TBC.

Ethics approval: Ethical approval for the CALM study was granted by the NHS Health Research Authority NRES Committee East of England, REC approval reference 13/EE/0157, IRAS 127675. Ethical approval for the current study was granted by the

University of East Anglia's Faculty of Medicine and Health subcommittee (ETH2324-0329).

Consent to participate: Written informed consent to participate was provided by parents/carers with verbal assent given by children.

Consent for publication: At the time of consent/assent, parents and children agreed that their data could be used by members of the CALM Team and their collaborators for analysis and publication.

Correspondence: TBC.

Abstract

Neurodevelopmental conditions and mental health disorders are conceptualised by traditional diagnostic models as distinct categories. However, categorical models do not account for the high rates of comorbidity, within disorder heterogeneity, and lack of boundaries. Transdiagnostic models of neurodevelopmental and mental health conditions may address some of these limitations. The consideration for neurodevelopmental conditions alongside mental health difficulties in these transdiagnostic frameworks is limited. The current study applied a data-driven clustering approach to explore profiles of children and adolescents in relation to characteristics of ADHD, anxiety and depression. The Centre for Attention Learning and Memory (CALM) dataset (Holmes et al., 2019) ($N=453$) provided data from parental reports of validated screening measures: Conners-3 (Conners, 2008), Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997), Child Communication Checklist (CCC-2; Bishop, 2003), and the Revised Child and Anxiety and Depression Scale (RCADS-P; Chorpita et al., 2000). Items from the measures were mapped against the diagnostic criteria for ADHD, anxiety and depression as outlined in the DSM-5 (APA, 2013). Exploratory factor analyses were conducted with 50 items from the Conners-3 (Conners, 2008) and the RCADS-P (Chorpita et al., 2000) that mapped onto the diagnostic criteria, producing a six-factor model. The six factors produced were Inattention, Separation Anxiety, Depression, General Anxiety, Social Anxiety, and Hyperactivity. A K-means clustering was applied to individuals' factor scores across the six domains. The data-driven subgrouping approach identified homogeneous groups that could be defined by a severity split whereby one group was elevated across all domains. Therefore, it was more likely that children and adolescents experienced symptoms across multiple domains/diagnoses and were not defined by a discrete diagnostic category. The findings from all analyses supported a transdiagnostic conceptualisation of neurodevelopmental conditions and mental health difficulties. Clinical and future research implications are explored, emphasising the importance of person-centred and needs-based approaches.

Keywords: ADHD, Depression, Anxiety, Comorbidity, Childhood, Adolescents

Exploring the Overlap of Symptoms of ADHD, Depression and Anxiety in Children and Adolescents.

Mental Health and ADHD in Childhood and Adolescence

Childhood into adolescence is marked by biological, cognitive, and social changes (Blakemore & Mills, 2014; Gee et al., 2018; Kessler et al., 2005; Tamnes et al., 2017; Velthuis & McAlonan, 2022). The estimated global prevalence rate of mental health and neurodevelopmental disorders in children and adolescents is 13.4%, with the estimated prevalence rates of any anxiety disorder being 6.5%, depressive disorders at 2.6%, and attention deficit and hyperactivity disorder (ADHD) at 3.4% (Polanczyk et al., 2015). The estimated pooled prevalence rate in Europe of 15.5% (Sacco et al., 2024). Anxiety disorders had the highest pooled prevalence rate (7.9%), followed by ADHD (2.9%) and depressive disorders (1.7%). Research suggests mental health disorders have been increasing with steep increases in mental health referrals for anxiety, depression, sleep disorders, suicidal behaviour, stress-related disorders, ADHD, and other mental health difficulties (Piao et al., 2022).

Comorbidity

Research suggests that anxiety and depression can co-occur in children and adolescents (Garber & Weersing, 2010). The prevalence rate of comorbid depression and anxiety ranges from 10-62% (Angold et al., 1999; Axelson & Birmaher, 2001; Brady & Kendall, 1992; Costello et al., 2003). Youth with comorbid anxiety and depression are often seen to have greater symptom severity and show greater resistance to treatment than in individuals where the diagnosis occurs in isolation (Melton et al., 2016). Research states that it is difficult to differentiate between concurrent and sequential comorbidity (Cummings et al., 2014). However, depressed youths tend to report high levels of both depression and anxiety, whereas anxious youths tend to report high levels of anxiety but relatively low levels of depression (Brady & Kendall, 1992; Ferdinand et al., 2005; Guberman & Manassis, 2011).

The relationship between ADHD and mental health disorders has also been widely examined, with evidence suggesting that children and adolescents frequently

present with comorbid ADHD and various mental health conditions (Busch et al., 2002; Boulton et al., 2023; Hansen et al., 2018; Ogundele & Morton, 2022; Reale et al., 2017). Anxiety is one of the most common mental health disorders in children and adolescents with ADHD (de la Barra et al., 2013; Jarrett & Ollendick, 2008; Yüce et al., 2013). It has also been indicated that depression and ADHD co-occur (Blackman et al., 2005; Meinzer et al., 2014). Compared to ADHD as a singular diagnosis, the co-occurrence with a mental health difficulty is associated with greater negative impact on social development and academic achievement, further psychiatric difficulties, and a higher rate of suicide attempts (Biderman et al., 2008; Blackman et al., 2005; Daviss, 2008; Rydell et al., 2017).

There are various reasons proposed for the associations between diagnoses. One explanation is that there is a bi-directional relationship between the conditions whereby each diagnosis may increase the risk of development of the other, or an exacerbation of symptoms. It is indicated that earlier onset of depression predicts later anxiety (Costello et al., 2003; Hammen et al., 2008). It is further suggested that anxiety may also be a risk factor for the development of depression, for example, where prolonged physiological arousal from anxiety leads to 'shut down' (Avenevoli et al., 2001; Seligman & Ollendick, 1998; Zahn-Waxler et al., 2000). This suggests a bidirectional relationship between anxiety and depression. Similarly, ADHD may increase the risk of developing a mental health condition, for example, negative experiences caused by ADHD symptoms may lead an individual to experience anxiety and/or depression (Agnew-Blais et al., 2018; Gair et al., 2021; Hansen et al., 2018; Jarrett & Ollendick, 2008; Meinzer et al., 2014; Owens et al., 2017; Tai et al., 2013; Oh et al., 2024). Additionally, experiencing anxiety and depression, can negatively impact on ADHD presentation, for example, social and emotional impairments experienced by individuals with ADHD (Pallanti & Salerno, 2020; Reimherr et al., 2017; Wehmeier et al., 2010). The comorbidity between diagnoses may also be due to similar risk and protective factors, including shared environmental and genetic factors (Cole & Deater-Deckard, 2009; Epkins & Heckler, 2011; Michelini et al., 2015; Thapar et al., 2013).

A further reason for the comorbidity between diagnoses is an overlap in the constructs of ADHD, depression and anxiety (Brady & Kendall, 1992; Seligman & Ollendick, 1998). For example, research has shown similar underlying functions including deficits in cognitive, behavioural, and regulatory functions (Baune et al., 2010; Diamond, 2011; Hallelund et al., 2012; Hammar & Aardal, 2012; Jarrett & Ollendick., 2008; Johnson et al., 2003; Lundervold et al., 2011; Papakostas & Culpepper, 2015; Scofield et al., 2009; Seymour et al., 2014). The diagnoses also share symptoms. For example, anxiety and depression share negative affectivity encompassing neuroticism, rumination, and intolerance of uncertainty (Griffith et al., 2010; McLaughlin & Nolen-Hoeksema, 2011; Murphy et al., 2004; Trosper et al., 2012). ADHD and anxiety both share symptoms of inattention, irritability, distractibility, difficulty in concentration, restlessness, sleep disturbances, and emotional regulation skills (APA, 2013; Jarrett & Ollendick, 2008; Weiss et al., 2011). ADHD symptoms also overlap with depression whereby restlessness, fatigue, sleep disturbances, concentration and emotional regulation difficulties are prevalent in both diagnoses (APA, 2013; Corbisiero et al., 2013; Di Nicola et al., 2014; Retz et al., 2012).

Therefore, the overlap between ADHD, depression, and anxiety may be due to a complex relationship including shared risk factors, overlapping definitions and constructs, or joint cognitive, behavioural and emotional components.

Conceptual Frameworks of Neurodevelopmental and Mental Health Conditions

Traditional diagnostic models involved in clinical psychology research and practice rely on category-based distinct diagnoses (Kendler, 2009; Riegler et al., 2013). One of the main diagnostic models used in psychology currently is the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM–5; American Psychiatric Association, 2013). However, research has indicated that there may be limitations with the traditional diagnostic system, including symptoms often occurring across diagnoses (Coghill & Sonuga-Barke, 2012; Faraone et al., 1998; Kessler et al., 2005), and within each diagnosis, the presentation of symptoms can be highly heterogeneous (Luo et al., 2019; Musliner et al., 2016; Nelemans et al., 2014; Rommelse et al., 2011; Willcutt &

Pennington, 2000). Another challenge to the traditional diagnostic model is that individuals who do not meet all the criteria to gain a diagnosis, but present with difficulties that impact their daily lives, are underrepresented in the research literature and do not always receive support (Coghill & Sonuga-Barke, 2012). The failure to gain an appropriate conceptualisation and understanding of diagnosis and the difficulties that individuals experience, can influence the interventions offered to individuals, leading to possible inappropriate and ineffective intervention and management strategies, resulting in negative outcomes for individuals.

Transdiagnostic models focus on causes of the symptoms and characteristics themselves rather than distinct category-based approaches, conceptualising psychopathology as multiple hierarchically organised continuous dimensions (Caspi et al., 2014; Caspi & Moffitt, 2018; Dalgleish et al., 2020; Lahey et al., 2012, 2017; Martel et al., 2017; Patalay et al., 2015). Transdiagnostic models have advantages in that interventions can be tailored to an individual's needs, rather than being based on singular and potentially inaccurate diagnostic labels (Newby et al., 2015; Weisz et al., 2012). Theoretical and practical implications may include the mitigation of assigning multiple diagnoses, better understanding of the overlap and differentiation between and within diagnoses, respectively, inclusivity of all individuals who may require support irrespective of diagnosis, capturing the complexity of individuals, and improving person-centred care (Dalgleish et al., 2020; Ehrenreich-May & Chu, 2013).

Transdiagnostic dimensional approaches have been endorsed in relation to both mental health difficulties (Cuthbert & Insel, 2013; Doherty & Owen, 2014), and neurodevelopmental conditions (Astle et al., 2022; Holmes et al., 2021; Sonuga-Barke & Coghill, 2014; Zhao & Castellanos, 2016). Among the few studies that have investigated data driven transdiagnostic models in relation to both mental health and neurodevelopmental conditions, most have focused on predictive pathways, for example, investigating how neurodevelopmental traits increase vulnerability to later mental health difficulties (Holmes et al., 2021; Parkes et al., 2021; McKenney et al., 2023; Nielsen et al., 2021), mental health difficulties and autism (Akkermans et al.,

2019; Kuo et al., 2020) or ADHD comorbid with other psychiatric conditions (Jacobs et al., 2021). To our knowledge, no existing research has directly explored the overlapping symptomology of anxiety, depression, and ADHD using DSM-5 criteria (APA, 2013) within a transdiagnostic, dimensional framework. This represents a critical gap, given the high rates of comorbidity and symptom overlap in both clinical and community populations. Research into transdiagnostic models may provide a promising alternative to diagnostic approaches. However, the existing research base remains limited, and transdiagnostic approaches have yet to produce a meaningful shift in how mental health conditions are classified or managed in clinical practice (Fusar-Poli et al., 2019). This highlights the importance of continuing to contribute to research exploring transdiagnostic models.

Current Aims, Study and Research Questions

The current study explored the presentation of individual symptoms of anxiety, depression, and ADHD in a large transdiagnostic sample of children and adolescents, to investigate whether symptom profiles align with diagnostic categories. The data for the current study was from a transdiagnostic sample of children and adolescents who were referred due to difficulties with learning, memory, and/or attention as part of the Centre for Attention Learning and Memory (CALM) study (Holmes et al., 2019).

To explore symptom profiles in this sample, items from questionnaires commonly used in the diagnosis of these conditions (the Conners-3 [Conners, 2008], the Revised Child Anxiety and Depression Scale – Parent version [RCADS-P, Chorpita et al., 2000], the Strengths and Difficulties Questionnaire [SDQ; Goodman, 1997], the Child Communication Checklist [CCC-2; Bishop, 2003]), that mapped directly onto at least one diagnostic criterion were included. Previous research has utilised subscales to explore clusters of symptoms, whereas the current research explores individual symptoms. Subscale scores average across multiple items, potentially masking the variability of individual symptoms, alongside the inclusion of functional behaviours that relate indirectly to criteria, whereas symptom level data allows direct exploration of

DSM-5 (APA, 2013) criteria at the specific symptom level. This will allow for profiles that are not confined to standard subscale groupings.

Data for these items were then submitted to a factor analysis to identify data-driven dimensions of mental health and neurodevelopment conditions. Network and cluster analytic approaches were applied to the resulting factor scores to identify subgroups of children within the sample with different profiles across these dimensions. Cluster analysis organizes individuals based on shared symptom patterns, facilitating the identification of groups with distinct symptom profiles. These profiles may correspond to conventional diagnostic categories or support more transdiagnostic conceptualizations, where symptomatology spans multiple traditional clinical diagnoses. The characteristics of these subgroups (clusters) were compared to investigate whether they aligned with traditional diagnostic boundaries.

This was a fully data-driven study, so we had no hypotheses. Our research questions were: i) what are the broad dimensions of mental health and neurodevelopmental conditions underpinning individual symptoms within this transdiagnostic sample? The choice of symptoms was guided by selecting items that mapped directly against the diagnostic criteria for anxiety, depression, and ADHD from questionnaires commonly used in the diagnosis of these conditions. ii) can we identify subgroups of children presenting with distinct profiles of mental health and neurodevelopmental conditions across these dimensions? iii) do such data-driven groups align with diagnostic categories, or show any differences in demographics?

Methods

The data was collected as part of a longitudinal cohort study with two time points at the Centre for Attention, Learning, and Memory (CALM) (Holmes et al., 2019). Data collection took part between 2014 and 2021. Recruitment details and testing procedures are described in full in the study protocol (Holmes et al., 2019). Here we provide a short overview of the full study, reporting in detail the sample and measures included in the current analyses. Only data from the first time point were included in the current analyses.

Participants

The full CALM dataset consists of two groups of children: (a) a cohort of children aged 5–18 years who were referred by health and education practitioners (e.g., Child and Adolescent Mental Health Services [CAMHS] & paediatric practitioners, educational psychologists, special needs co-ordinators, and speech and language therapists) for having functional difficulties in learning, memory, and/or attention, ($N = 805$ individuals aged 5-18 years old, 69% male, M age = 9.48, SD age = 2.38); (b) a comparison group who attended the same schools as the referred children, but did not have identified difficulties, and who were recruited via an open study invitation ($N = 187$ children, 56% male, M age = 10.04, SD age = 2.36). Children in both groups were enrolled into the study irrespective of diagnostic status or performance cut-offs, providing they met the following inclusion criteria: (a) native English speaker, (b) no uncorrected sensory impairments, and (c) no confirmed presence of genetic or neurological conditions known to affect cognitive ability. Individuals with an intellectual disability were not excluded based on diagnosis. However, individuals were excluded if the severity of their disability meant they could not engage with the assessment battery.

The current sample included all participants for whom all of the relevant measures were available ($N = 453$ participants, 65.34% male, M age = 10.52, SD age = 2.25), $n = 155$ with recognised difficulties but no formal diagnosis, and $n = 165$ with at least one diagnosed mental health or neurodevelopmental condition. An Index of Multiple Deprivation (IMD; Ministry of Housing, Communities & Local Government, 2019) classified the socio-economic status of the sample. Scores for different local areas in the UK range from 1st to 32 844th (most to least deprived). The range of IMD for the sample indicated participants came from areas with varying degrees of deprivation, with an average ranking above the national median.

Procedure and Measures

Full details about the procedure can be found in the study protocol paper (Holmes et al., 2019). Ethical approval was granted by the National Health Service (NHS) Health Research Authority NRES Committee East of England, REC approval reference 13/EE/0157, IRAS 127675. Data from the following measures were included in the current study: RCADS-P (Chorpita et al., 2000), Conners 3 (Conners, 2008), SDQ (Goodman, 1997), and the CCC-2 (Bishop, 2003). The current analyses were granted ethical approval by the University of East Anglia's Faculty of Medicine and Health subcommittee (ETH2324-0329) (Appendix C). Measures have not been included in appendices due to copyright.

Revised Child Anxiety and Depression Scale – Parent Version (RCADS-P; Chorpita et al., 2000)

The RCADS-P (Chorpita et al., 2000) is a measure of a child's symptoms of anxiety and low mood as rated by their parent/carer (RCADS-P). It contains 47 items that are rated on a scale of 'Never' (0) to 'Always' (3). These are summed to provide subscale scores for separation anxiety, social phobia, panic disorder, generalized anxiety disorder (GAD), obsessive compulsive disorder (OCD), and major depressive disorder (MDD), and total scores for anxiety, low mood, and combined depression and anxiety. The total score for anxiety includes the subscales for GAD, panic disorder, separation anxiety disorder, social phobia, and OCD. The total depression score refers to the MDD subscale. The total depression and total anxiety score are combined to produce the internalising score. The scale has high internal consistency, test-retest reliability, and good convergent and divergent validity in clinical samples (internal consistency indicating $\alpha = .95$ [Ebesutani et al., 2010b]) and non-clinical samples (internal consistency indicating $\alpha = .93$; [Ebesutani et al., 2011]). Raw scores are calculated and converted to T-scores. For reference, T-scores of 65–69 are within the borderline clinical range, and T-scores of 70 + are above the clinical cut-off (Chorpita et al., 2000).

Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997)

The SDQ (Goodman, 1997) requires parents/carers to rate 25 items about their child's behaviour over the past 6 months on a scale of 'Not True' (0) to 'Certainly True'

(2). These can be summed into five subscales measuring emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems and prosocial behaviour based on their child's behaviour in the past six months. The first four subscales can be summed to provide a total difficulties score. A total score of 17 and above is considered elevated. The SDQ has good internal consistency reliability ($\alpha = .73$), retest stability ($r = .62$), and convergent and divergent validity in child and adolescent populations (Goodman, 2001).

Conners-3 Parent Rating Scale Short Form (Conners, 2008)

The Conners-3 Short Form (Conners, 2008) assesses symptoms relating to ADHD. Parents/carers rate the frequency over the past month of 46 descriptions of different behaviours on a scale of 'Never' (0) to 'Very Often' (3). These form six subscales measuring inattention, hyperactivity/impulsivity, learning problems, executive function, aggression and peer relations. The Conners-3 (Conners, 2008) has good internal consistency reliability ($\alpha = .9$), test-retest stability ($r = .83$), and good convergent and divergent validity in child and adolescent populations (Conners, 2008; Izzo et al., 2019). Raw scores for subscales are converted into T-scores where 65-69 indicates mild concerns, T-scores of 70-74 indicate moderate concern, and T-scores of 75 and above indicate severe concerns (Conners, 2008).

Child Communication Checklist 2 (CCC-2; Bishop, 2003)

The CCC-2 (Bishop, 2003) is a 70-item parent/carer rating questionnaire assessing three aspects of language and communication: structural language, pragmatic communication, and pragmatic social skills. Parents rate their child's communication ability using a scale of 'less than once a week' (0) to 'several times (3) (more than twice a day)' across the 70 items. These three areas of communication are captured by 10 subscales as follows: four subscales, Speech, Syntax, Semantics and Coherence assess structural language; four different subscales, Inappropriate Initiation, Stereotyped Language, Use of Context and Nonverbal Communication assess nonverbal pragmatic communication skills; and two subscales, Social Relations and Interest's assess social

pragmatic skills that can differentiate individuals with and without autism. The CCC-2 (Bishop, 2003) has good internal consistency ($\alpha = 0.96$), and good convergent and divergent validity in child and adolescent populations (Nowell et al., 2022; Wellnitz et al., 2021).

Analysis Plan

Analyses were conducted in four steps: mapping of questionnaire items against diagnostic criteria, exploratory factor analysis (EFA), cluster analysis, and group comparisons. In the first step, all items from the RCADS-P (Chorpita et al., 2000), CCC-2 (Bishop, 2003), SDQ (Goodman, 1997) and Conners 3 (Conners, 2008) were mapped against the diagnostic criteria for ADHD, depression and anxiety as set out in the DSM-5 (APA, 2013) by three independent researchers - a trainee clinical psychologist, an expert in transdiagnostic approaches and an expert developmental psychologist. Each person rated whether each questionnaire item directly measured any of the diagnostic criteria for the three conditions. Inter-rater reliability was conducted on these ratings, and any items where there was disagreement between all three researchers was discussed by all three people together until a consensus was agreed. Items that were phrased negatively were reverse coded prior to analysis.

In the second stage, all items from the questionnaires that mapped on to diagnostic criteria were submitted to an exploratory factor analysis to determine their underlying factor structure. These analyses were conducted in *R* Studio (R Core Team, 2024), using the packages ‘psych’ (Revelle, 2019), and ‘mice’ (Van Buuren, & Groothuis-Oudshoorn, 2011). A combination of parallel analysis and visual inspection of scree plots were used to determine the maximum number of factors to extract. Parallel analysis involves simulations that create random datasets with properties similar to the true data: estimated numbers of factors are extracted and compared to a permuted baseline, and extraction is stopped when eigenvalues fall within the 95% confidence interval of eigenvalues from the simulated data, revealing the optimal number of factors to extract from the true data. For the EFA, polychoric correlations were used as the data were ordinal data with varying numbers of response categories per

item. Kaiser-Meyer-Olkin (KMO) and Bartlett's were calculated to test for sampling adequacy, and factor loadings were rotated using an oblique rotation (direct oblimin) to allow the factors to correlate. Factor reliability analysis was calculated via Cronbach's alpha. Factor structures were considered interpretable if they provided a good fit to the data and there was a minimum of two primary loadings per latent construct (Costello & Osborne, 2005). The labelling of the factors reflected the constellation of the highest loading variables. Fit indices outlined by Schermelleh-Engel, Moosbrugger, and Müller (2003) were used. These included the root mean square error of approximation (RMSEA) and its confidence interval, the Tucker Lewis Index (TLI), and the standardized root mean squared residuals (RMSR). The chi-square test and its corresponding p-value were also reported. A good model fit was defined as $RMSEA < 0.06$, $TLI > 0.90$, and an acceptable fit was defined as $RMSR 0.05-0.08$. Where there were two similar fitting models, a chi square difference test was used to determine whether one model was a significantly better fit to the data.

In the third step, data-driven k-means clustering was conducted on the factor scores derived from the exploratory factor analyses to determine subgroups of children with different profiles across the factors. K-means clustering was chosen over other clustering methods for its non-parametric nature and because it makes fewer assumptions about the data than other clustering methods, meaning it aligned well with the exploratory nature of the analysis. It separates a dataset into distinct groups, or clusters, by grouping data points that are similar to each other while ensuring that the clusters themselves are as distinct as possible. Following good practice recommendations, before clustering, the optimal number of clusters was determined using the average silhouette method. These analyses were completed in *R* Studio (R Core Team, 2024), using the packages *factoextra* (Kassambara & Mundt, 2020), *cluster* (Maechler, 2019), *smacof* (Mair et al., 2024), *finalfit* (Harrison et al., 2024), *dplyr* (Wickham et al., 2023), *janitor* (Firke, 2023), *missForest* (Stekhoven & Buehlmann, 2012), *MASS* (Venables & Ripley, 2002), *mice* (Van Buuren, & Groothuis-Oudshoorn, 2011), and *psych* (Revelle, 2019).

In the final step the resulting clusters were characterised and compared on the factor scores, and by demographic factors.

Results

The sample characteristics are summarised in Table 1. The overall sample (the referred sample and comparison sample combined) were elevated on the Conners-3 (Conners, 2008) Inattention subscale and Hyperactivity subscale, with scores above the clinical cut-off. The mean score for the overall sample on the CCC-2 (Bishop, 2003) also suggests clinically significant communication problems. The overall sample scores were in the age-expected range on the SDQ (Goodman, 1997), the RCADS-P (Chorpita et al., 2000) total score, and the RCADS-P (Chorpita et al., 2000) Anxiety and Depression subscale scores. It is important to note that there were significant differences between the referred sample and the comparison sample, with the referred sample showing elevated levels across all measures. In addition to the Conners-3 (Conners, 2008) Inattention and Hyperactive subscales, the referred sample also met the clinical cut off for Depression on the RCADS-P (Chorpita et al., 2000). A summary of differences between samples can be seen in Table 2 below.

Table 1

Demographics for Overall sample, Referred Sample, and Comparison Sample.

	<i>Total</i>	<i>Referred</i>	<i>Comparison</i>
<i>N (%)</i>	453 (100)	310 (68.43)	143 (31.57)
<i>Age M (SD)</i>	10.52 (2.25)	10.31 (2.40)	10.98 (1.83)
<i>Sex</i>			
Female (%)	157 (34.66)	94 (30.32)	63 (44.06)
Male (%)	296 (65.34)	216 (69.68)	80 (55.94)
<i>Diagnosis (%)</i>	165 (36.42)	155 (50)	10 (6.99)
<i>No Diagnosis (%)</i>	288 (63.58)	155 (50)	133 (93.01)
<i>Diagnosis</i>			
ADHD Inattentive	6 (1.32)	6 (1.94)	0 (0)

ADHD Hyperactive	0 (0)	0 (0)	0 (0)
ADHD Combined	100 (22.08)	98 (31.61)	2 (1.40)
Depression	1 (0.22)	1 (0.32)	0 (0)
Anxiety	9 (1.99)	4 (1.29)	5 (3.50)

Note: Age M (SD) is provided in months.

Table 2

Average Raw Scores and T-Test Results Highlighting the Differences Between the Referred and Comparison Samples

<i>Measure (Sample)</i>	<i>N</i>	<i>Mean Score (SD)</i>	<i>F</i>	<i>p</i>	<i>t</i>	<i>df</i>	<i>p</i>
Conners - Inattention							
Total	453	9.66 (5.01)					
Referred	310	12.16 (3.12)	8.580	.004	21.335	226.92	<.001
Comparison	143	4.21 (3.91)					
Conners – Hyperactivity							
Total	453	8.97 (6.01)					
Referred	310	11.30 (5.26)	25.686	<.001	16.219	342.65	<.001
Comparison	143	3.89 (4.12)					
SDQ - Total							
Total	453	16.18 (8.88)					
Referred	310	19.93 (7.18)	6.531	.011	17.667	303.57	<.001
Comparison	143	8 (6.42)					
RCADSP - Total							

Total	444	34.99 (22.145)					
Referred	304	42.36 (21.89)	27.079	<.001	11.166	370.47	<.001
Comparison	140	21.16 (15.41)					
<i>RCADSP -</i>							
<i>Anxiety</i>							
Total	444	27.47 (17.77)					
Referred	304	32.09 (17.87)	27.119	<.001	9.881	367.55	<.001
Comparison	140	17.42 (12.71)					
<i>RCADSP –</i>							
<i>Depression</i>							
Total	453	7.58 (5.44)					
Referred	310	9.35 (5.29)	40.543	<.001	13.463	398.68	<.001
Comparison	143	3.74 (3.44)					
<i>CCC-2</i>							
Total	450	48.39 (28.60)					
Referred	308	35.51 (21.43)	.801	.371	-18.810	448	<.001
Comparison	142	76.35 (21.35)					

What are the broad dimensions of mental health?

Item Inclusion

All items from CCC-2 (Bishop, 2003), SDQ (Goodman, 1997), Conners 3 (Conners 2008), and RCADS-P (Chorpita et al., 2000) (a total of 185 items) were mapped against the DSM-V (APA, 2013) criteria for ADHD, depression and anxiety (a total of 33 criteria; see Supplementary Materials for full list of diagnostic criteria and questionnaire items) independently by three researchers. The inter-rater reliability between all three authors was 45.36%, with an additional 16.49% agreement between two of the three authors. Items where there was no agreement (38.14%) were discussed by all three researchers until a consensus was found.

A total of 70 items (37.8 % of the total number of measure items) matched at least one diagnostic criteria (see Appendix D for the measure items mapped onto each diagnostic criteria, and Supplementary Materials for the outcome of the overall mapping process). A total of 29 items matched the diagnostic criteria for ADHD: five from the CCC-2 (Bishop, 2003), four from the SDQ (Goodman, 1997), 19 from the Conners-3 (Conners, 2008), and one from the RCADS-P (Chorpita et al., 2000). A total of 28 items matched the diagnostic criteria for depression: one from the CCC2 (Bishop, 2003), five from the SDQ (Goodman, 1997), 11 from the Conners-3 (Conners, 2008), and 11 from the RCADS-P (Chorpita et al., 2000). In relation to the measure items that mapped onto the diagnosis of anxiety, 45 items were included. These items consisted of seven items from the SDQ (Goodman, 1997), 10 items from the Conners-3 (Conners, 2008), and 28 items from the RCADSP (Chorpita et al., 2000). Some items matched more than one set of diagnostic criteria: 22 matched criteria for both anxiety and depression, 16 matched criteria for both ADHD and anxiety, and 14 matched criteria for both ADHD and depression. A total of 14 measure items matched criteria for all three conditions.

Exploratory Factor Analysis

Multivariate Imputation by Chained Equations (MICE; Van Buuren & Groothuis-Oudshoorn, 2011) was run using the MICE package to estimate 130 missing data points. A parallel analysis was conducted using the R psych package (Version 2.4.12) (Revelle, 2019) to determine the number of factors underlying variance in the 70 questionnaire items that matched diagnostic criteria. A seven-factor solution was indicated by the parallel analysis. Inspection of the scree plot aligned with this assumption, but did show inflections that would justify five- and six-factor models (Cattell, 1966b; Stevens, 2000). EFA conducted separately for an eight-, seven-, six- and five-factor model, using an oblimin (oblique) rotation that allowed the factors to be correlated, revealed that all models yielded a very poor fit to the data (see Table 1 in Appendix E). The rotated factor solutions for these models can be seen in the Appendix F.

One explanation for the poor fit of these models is multicollinearity – many of the 70 items have very similar wording and are likely to be highly correlated. To identify multicollinearity, a Spearman's Rank correlation matrix was produced and pairs of items with correlation coefficients exceeding 0.8 were highlighted. Where an item correlated over .8 with only one other item, one item from the pair was removed. In total, three items from the SDQ (Goodman, 1997), five from the Conners-3 (Conners, 2008) and one from the RCADS-P (Chorpita et al., 2000) were removed (see Supplementary Materials for the correlation table and Appendix G for a list of items removed).

A parallel analysis was conducted on the remaining 61 items. An eight-factor solution was indicated. The scree plot aligned, but it once again revealed inflections that would justify five-, six- and seven-factor models, which were all tested through EFA alongside an eight-factor model. Overall, removing highly correlated items improved the fit of these models (see Table 1 in Appendix E for fit indices and Appendix H for rotated factor solutions for each model with items removed). The fit indices revealed a more adequate fit to the data for all models, with better fit indices for factor solutions with fewer factors.

In an attempt to improve the model fit further, the number of items was further reduced to increase the case-to-variable ratio as far as possible. Items from the CCC-2 (Bishop, 2003) and SDQ (Goodman, 1997) were removed as these questionnaires are not as commonly used in the diagnosis of ADHD, depression, or anxiety. A parallel analysis conducted on the remaining 50 items (17 from the Conners-3 [Conners, 2008] and 33 from the RCADS-P [Chorpita et al., 2000], see Appendix I for a full list) indicated a seven-factor solution. The scree plot aligned with this, but inflections also justified five- and six-factor models (Cattell, 1966b). The fit indices for each of these models can be seen in Table 1, Appendix E, and the rotated factor solutions for each model with measures removed are presented in Appendix J. These models provided a better fit to the data than the previous models, with the five- and six-factor models providing a better fit to the data than the seven-factor model. This is due to items

loading highly onto one factor and low number of items loading onto other factors and due to theoretical examination indicating the six- and five- factor models may be a better fit for the data. A chi-squared difference test was conducted to determine whether there was a significant difference between the fit of the five- and six-factor models, which revealed that the six-factor model was a significantly better fit, $\chi^2(45, 493) = 594.47, p = <.01$. The rotated factor solution for the six-factor model is shown in Table 3. The items loading most heavily on factor 1 captured inattentive behaviours, so this was labelled Inattention. Items loading most heavily on factor 2 were associated with fears and worries about being alone or apart from family and friends, so this was labelled Separation Anxiety. Factor 3 mostly captured items measuring low mood, so it was labelled Depression. The items loading most heavily on the fourth factor were related to anxieties and worries, so this was labelled General Anxiety. The fifth factor captured items measuring worries and anxieties about how they are thought of by other people, so it was labelled Social Anxiety, and the final factor captured items related to excessive movement and activity so was labelled Hyperactivity. Reliability estimates for all factors were above .7.

Table 3

Rotated Factor Loadings for the 6-Factor Model

Item ID	Item	F1	F2	F3	F4	F5	F6
conners1	Forgets to turn in completed work	0.747	-0.011	0.005	-0.054	0.118	0.072
conners5	Restless or overactive	0.471	0.089	0.135	0.031	-0.112	0.503
conners7	Runs or climbs when he/she is not supposed to	0.398	0.097	0.086	-0.005	-0.067	0.565
conners9	Is difficult to please or amuse	0.207	-0.044	0.561	0.106	-0.011	0.320
conners11	Is hard to motivate (even with rewards like candy or money)	0.435	-0.022	0.518	-0.066	0.012	0.049
conners12	Makes mistakes	0.747	0.010	-0.025	0.108	0.010	0.039
conners13	Acts as if driven by a motor	0.432	0.037	0.089	0.042	-0.032	0.512
conners15	Has trouble getting started on tasks or projects	0.813	0.013	0.122	0.001	-0.010	-0.053

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conners16	Is happy, cheerful, and has a positive attitude (negative)	0.125	0.118	-0.603	-0.065	-0.053	-0.203
conners17	Doesn't pay attention to details; makes careless mistakes	0.871	0.006	-0.047	-0.039	0.054	0.014
conners20	Loses things (for example, schoolwork, pencils, books, tools, or toys).	0.792	-0.012	-0.020	-0.011	0.069	0.032
conners28	Excitable, impulsive.	0.531	0.109	-0.070	-0.077	0.068	0.497
conners32	Has trouble organizing tasks or activities.	0.860	-0.001	0.038	0.120	-0.026	-0.066
conners34	Inattentive, easily distracted.	0.776	0.122	0.035	0.042	-0.073	0.144
conners35	Is messy or disorganized.	0.737	0.071	-0.005	-0.110	0.101	0.013
conners37	Is patient and content, even when waiting in a long line (negative)	0.070	0.055	0.164	-0.011	-0.011	0.425
conners42	Has to struggle to complete hard tasks.	0.786	0.004	0.059	0.192	-0.035	-0.090
rcadsp1	My child worries about things.	0.018	0.305	0.230	0.500	0.003	-0.002
rcadsp2	My child feels sad or empty	0.010	0.050	0.391	0.103	0.026	0.156
rcadsp4	My child worries when he/she thinks he/she has done poorly at something.	-0.081	0.000	0.045	0.827	0.072	0.071
rcadsp5	My child feels afraid of being alone at home.	-0.036	0.841	-0.005	0.077	-0.099	-0.119
rcadsp6	Nothing is much fun for my child anymore.	0.009	0.022	0.780	0.040	0.043	0.111
rcadsp7	My child feels scared when taking a test.	0.218	0.084	0.098	0.526	0.087	-0.108
rcadsp8	My child worries when he/she thinks someone is angry with him/her.	0.118	0.279	-0.139	0.417	0.189	-0.169
rcadsp9	My child worries about being away from me.	0.080	0.701	-0.014	0.116	-0.025	-0.005
rcadsp11	My child has trouble sleeping.	0.132	0.349	0.289	0.212	-0.191	0.235
rcadsp12	My child worries about doing badly at school work.	0.069	0.020	-0.074	0.895	-0.024	0.028
rcadsp13	My child worries something awful will happen to someone in the family.	0.027	0.590	0.045	-0.040	0.320	0.084
rcadsp15	My child has problems with his/her appetite.	0.107	0.052	0.480	0.094	-0.123	0.092
rcadsp17	My child feels scared to sleep on his/her own.	0.120	0.841	-0.056	-0.047	-0.157	-0.040

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rcadsp18	My child has trouble going to school in the mornings because of feeling nervous or afraid	-0.068	0.268	0.347	0.348	0.072	0.147
rcadsp19	My child has no energy for things.	0.103	0.109	0.724	-0.033	0.019	-0.500
rcadsp20	My child worries about looking foolish.	0.129	0.019	0.003	0.191	0.651	-0.127
rcadsp21	My child is tired a lot.	0.209	0.077	0.380	0.133	0.099	-0.237
rcadsp25	My child cannot think clearly.	0.575	0.030	0.183	0.106	0.147	0.037
rcadsp27	My child worries that something bad will happen to him/her.	-0.083	0.517	0.080	0.055	0.422	0.131
rcadsp29	My child feels worthless.	0.008	0.084	0.339	0.276	0.311	0.172
rcadsp30	My child worries about making mistakes.	0.075	0.021	-0.043	0.757	0.137	-0.089
rcadsp32	My child worries what other people think of him/her.	-0.030	0.020	0.019	0.443	0.518	0.012
rcadsp33	My child is afraid of being in crowded places (like shopping centres, the movies, buses, busy playgrounds).	0.068	0.278	0.444	0.062	0.129	0.097
rcadsp34	All of a sudden my child will feel really scared for no reason at all.	-0.013	0.450	0.343	-0.021	0.257	0.152
rcadsp35	My child worries about what is going to happen.	0.038	0.448	0.045	0.128	0.412	0.057
rcadsp37	My child thinks about death	0.077	0.396	0.104	-0.103	0.323	0.136
rcadsp38	My child is afraid if he/she has to talk in front of the class.	0.268	-0.030	0.323	0.276	0.118	-0.202
rcadsp40	My child feels like he/she doesn't want to move.	0.123	0.105	0.609	-0.129	0.158	-0.111
rcadsp41	My child worries that he/she will suddenly get a scared feeling when there is nothing to be afraid of.	-0.019	0.433	0.193	-0.045	0.390	0.109
rcadsp43	My child feels afraid that he/she will make a fool of him/herself in front of people.	0.143	-0.096	0.058	0.193	0.737	-0.068
rcadsp45	My child worries when in bed at night.	-0.074	0.695	0.032	0.146	0.107	0.091
rcadsp46	My child would feel scared if he/she had to stay away from home overnight.	0.147	0.632	0.034	0.051	0.029	0.003

rcadsp47	My child feels restless.	0.392	0.294	0.109	0.022	0.023	0.345
	% of variance	15.2	9.6	8	7.2	4.9	4.5
	α	0.94	0.90	0.78	0.87	0.86	0.81

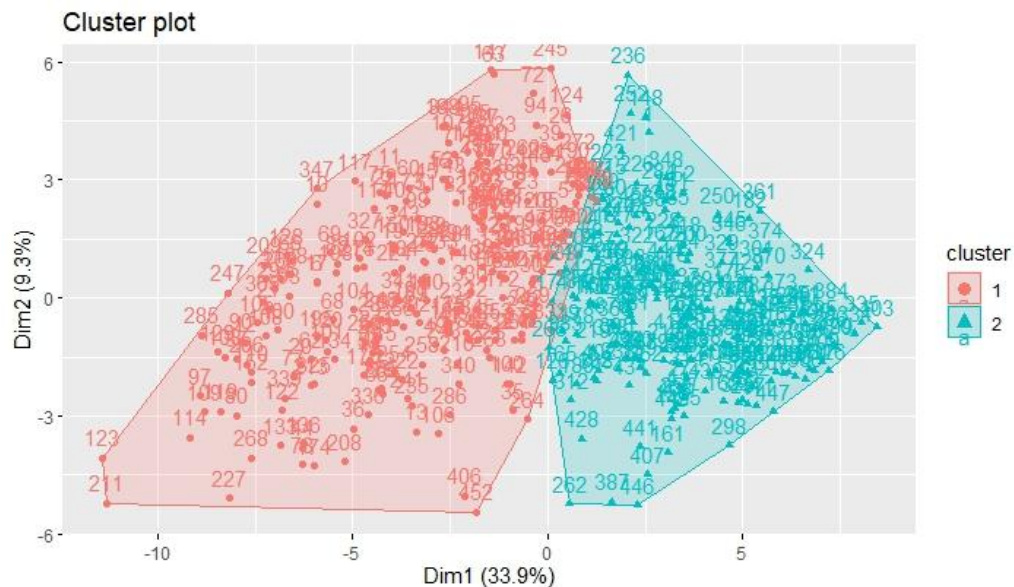
Note: Factor loadings over 0.30 appear in bold. If an item loads over 0.30 on more than one item, only the highest factor loading is in bold. The Kaiser-Meyer-Olkin (KMO) = 0.84, and Bartlett's test, $\chi^2(1225, 493) = 22195.13, p = 0.000$, revealed adequate sampling accuracy.

Can we identify robust subgroups of children presenting with distinct profiles of mental health and neurodevelopmental difficulties across these dimensions?

Factor scores for the six dimensions of mental health, Inattention, Separation Anxiety, Depression, General Anxiety, Social Anxiety, and Hyperactivity, were used to identify subgroups of children with similar profiles. The factor scores were analysed in order to optimise the clustering performance and reduce (scale) the dimensionality of the data. K-means clustering ($k = 2-10$) was then applied to the scaled space. The optimal number of clusters was chosen based on silhouette scores >0.5 . The clustering results indicate that a two-cluster solution was optimal. The scaled space on which each participant's factor scores for the six dimensions were projected is presented in Figure 2, with the clusters coded in different colours. Cluster 1 (shown in red) was comprised of 240 participants, Cluster 2 (shown in blue) was comprised of 213 participants.

Figure 1.

Cluster Plot of the Scaled Space for Each Participant's Factor Scores for Cluster 1 and Cluster 2 – Overall Sample



Cluster Characterisation

A series of two-tailed independent sample t-tests with Bonferroni corrected p-values were run to compare the profiles of the derived clusters to each other (see Table 4 for t-test analysis and Figure 2 for cluster profiles across the six dimensions). These analyses revealed significant differences between cluster 1 and cluster 2 on all factors. Both clusters showed the same pattern in relation to elevated levels across the following factors: Inattention, General Anxiety, Social Anxiety and Hyperactivity. The results of the cluster analysis indicated the significant difference between the two clusters was due to a severity split whereby cluster 1 was elevated on all factors in comparison to cluster 2.

Figure 2

Mean Item Scores per Cluster Across the Six Factors - Overall Sample

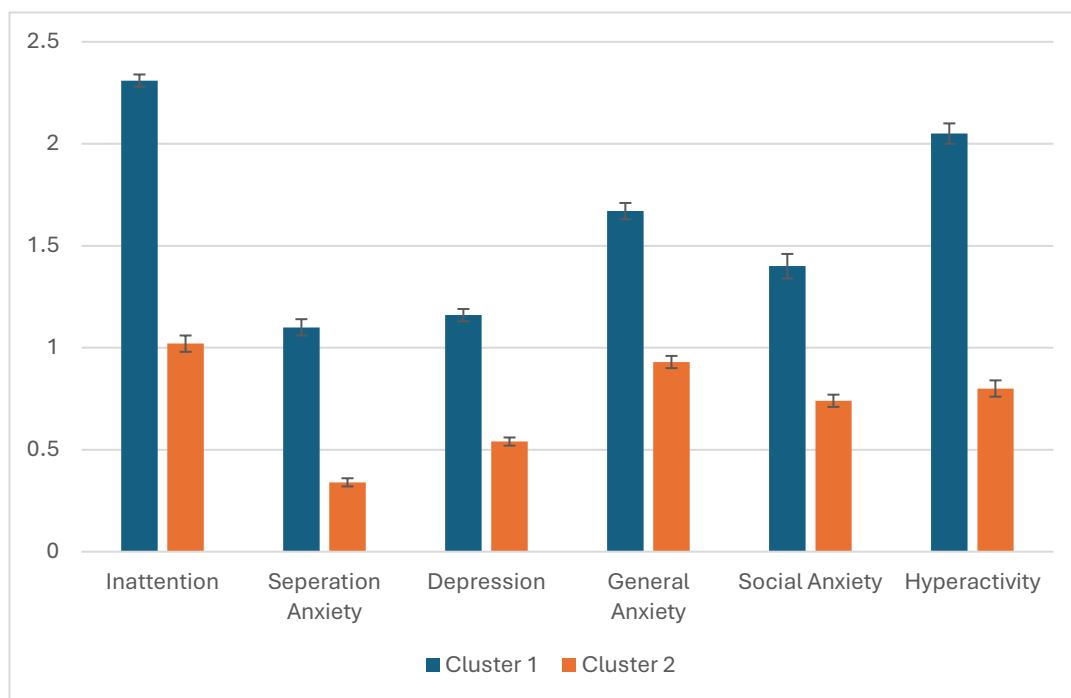


Table 4

Difference Analysis Between Cluster 1 and Cluster 2 Across the Six Factors.

<i>Factor</i>	<i>Cluster 1 Mean Item M (SD)</i>	<i>Cluster 2 Mean Item M (SD)</i>	<i>F</i>	<i>p</i>	<i>t</i>	<i>df</i>	<i>P</i>
Inattention	2.31 (0.39)	1.02 (0.6)	56.121	<.001	26.94	357.3	<.001
Separation Anxiety	1.1 (0.6)	0.34 (0.28)	122.19	<.001	17.576	346.69	<.001
Depression	1.16 (0.43)	0.54 (0.24)	56.674	<.001	19.1	387.32	<.001
Anxiety	1.67 (0.67)	0.93 (0.5)	30.138	<.001	13.875	425.09	<.001
Social Anxiety	1.4 (0.87)	0.74 (0.51)	67.019	<.001	9.91	394.57	<.001
Hyperactivity	1.05 (0.75)	0.80 (0.57)	29.563	<.001	20.170	440.70	<.001

Next, the prevalence of pre-existing diagnoses in each cluster was evaluated. The chi-square analysis results can be seen in Table 5. It is important to note that the analysis for differences in observations of ADHD - inattentive type, anxiety, and depression produced results with expected counts of less than 5. Therefore, Fishers Exact p-value has been reported. There were no counts of ADHD – hyperactive type. The analysis indicates that children with a diagnosis of ADHD and anxiety were over-represented cluster 1; other diagnoses were equally distributed between the clusters.

Table 5

Chi-Square and Fishers Exact Test Results for Analysis of Differences Between Cluster 1 and Cluster 2

Diagnosis	Cluster 1 N (%)	Cluster 2 N (%)	χ^2	df	p
ADHD – Inattentive	5 (2.08)	1 (0.47)			0.221
ADHD – Combined	76 (31.67)	24 (11.27)	27.298	1, 453	<.001
Anxiety	8 (3.33)	1 (0.47)			.040
Depression	1 (0.42)	0 (0)			1.000

Chi-square tests were also used to compare the proportion of males and females in each cluster, and t-tests were used to compare the average age of participants in each cluster. These analyses revealed that there were significant differences in gender between the individuals in cluster 1 and cluster 2 ($\chi^2(1, 453) = 4.890, p = 0.027$), with significantly more males in both clusters and more males in cluster 1 than cluster 2 (cluster 1 = 70% male, cluster 2 = 60% male). Chi-square analysis also found a significant difference between the number of individuals from the referred sample and comparison sample between the two clusters ($\chi^2(1, 453) = 159.470, p = <.001$). There was an increased number of individuals from the comparison sample in Cluster 2 ($N = 129$) than in cluster

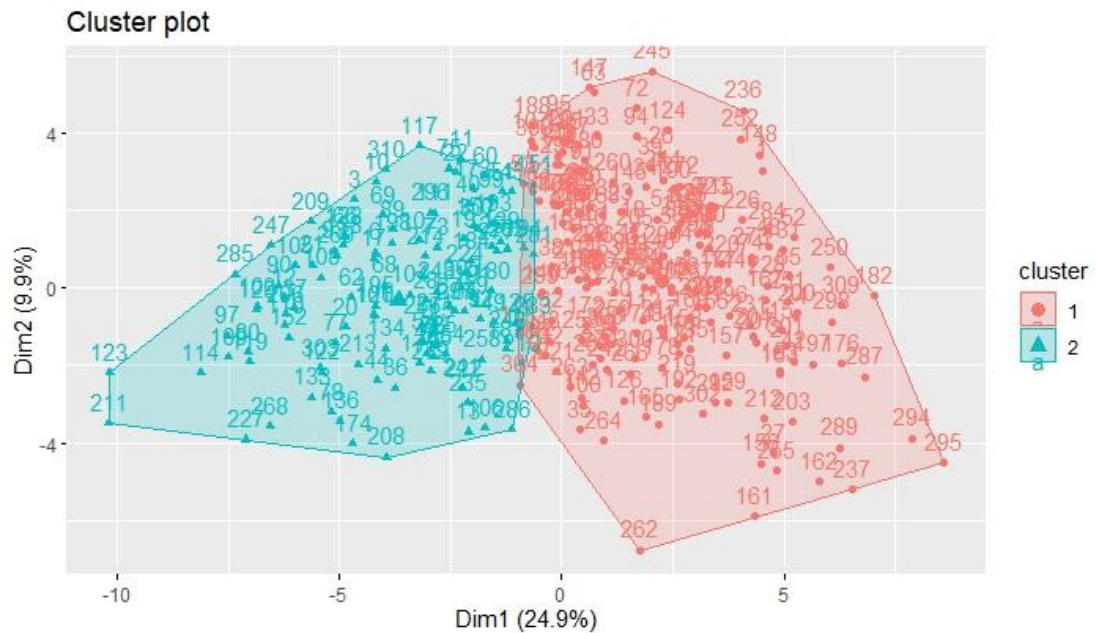
1 ($N = 13$), and a larger proportion of the referred sample in cluster 1 than the comparison sample (Referred $N = 227$, Comparison $N = 13$). An independent t-test also showed significant differences in age between cluster 1 ($M = 10.28$, $SD = 2.39$) and cluster 2 ($M = 10.82$, $SD = 2.04$), where $t(450.4) = -2.665$, $p = .008$.

Do these subgroups of children and adolescents present with similar profiles of mental health and neurodevelopmental difficulties across these dimensions when analysing the referred cohort?

Factor scores for the six dimensions of mental health, Inattention, Separation Anxiety, Depression, General Anxiety, Social Anxiety, and Hyperactivity, were used to identify subgroups of children with similar profiles. K-means clustering ($k = 2-10$) was then applied to the scaled space. The optimal number of clusters was chosen based on silhouette scores >0.5 . The clustering results indicate that a seven-cluster solution was optimal. The scaled space on which each participant's factor scores for the six dimensions of mental health were projected is presented in Figure 2, with the clusters coded in different colours. Cluster 1 (shown in red) was comprised of 192 participants, Cluster 2 (shown in blue) was comprised of 118 participants.

Figure 3

Cluster Plot of the Scaled Space for Each Participant's Factor Scores for Cluster 1 and Cluster 2 – Referred Sample



Cluster Characterisation

A series of two-tailed independent sample t-tests with Bonferroni corrected p-values were run to compare the profiles of the derived clusters to each other (see Table 6 for t-test analysis and Figure 4 for cluster profiles across the six dimensions of mental health). These analyses revealed significant differences between cluster 1 and cluster 2 on all factors. Both clusters showed the same pattern in relation to elevated levels across the following factors: Inattention, General Anxiety, and Hyperactivity. The results of the cluster analysis indicated the significant difference between the two clusters was due to a severity split whereby cluster 2 was elevated on all factors in comparison to cluster 1.

Figure 4

Mean Item Scores per Cluster Across the Six Factors - Referred Sample

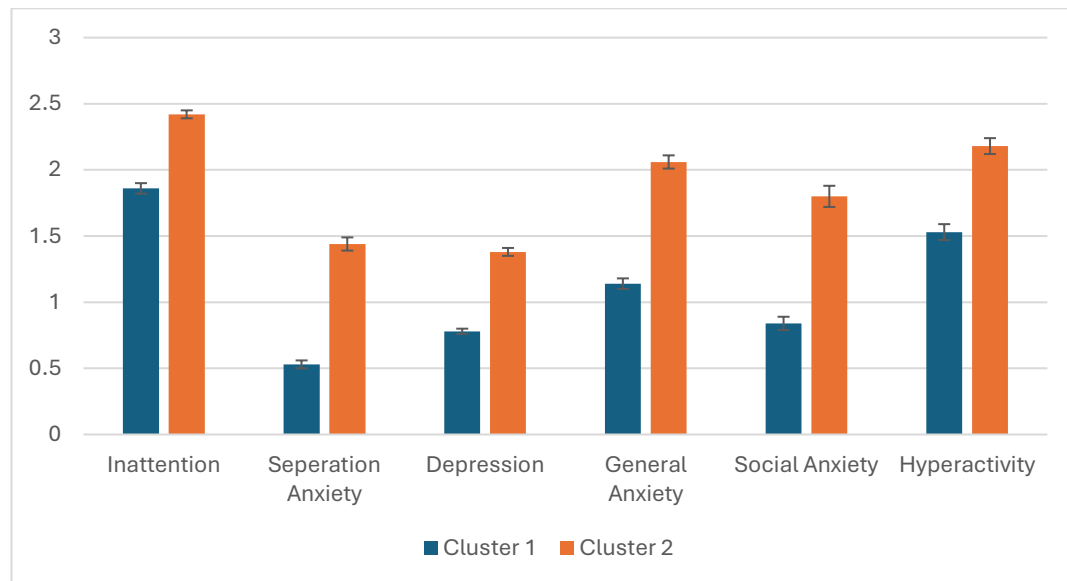


Table 6

Difference Analysis Between Cluster 1 and Cluster 2 Across the Six Factors.

<i>Factor</i>	<i>Cluster 1 Mean Item M (SD)</i>	<i>Cluster 2 Mean Item M (SD)</i>	<i>F</i>	<i>p</i>	<i>t</i>	<i>Df</i>	<i>P</i>
Inattention	1.86 (0.60)	2.42 (0.35)	24.063	<.001	-10.422	307.70	<.001
Separation Anxiety	0.53 (0.39)	1.44 (0.50)	10.021	.002	-16.920	204.03	<.001
Depression	0.78 (0.34)	1.38 (0.37)	1.057	.305	-14.243	308	<.001
Anxiety	1.14 (0.51)	2.06 (0.52)	0.368	.545	-15.270	308	<.001
Social Anxiety	0.84 (0.63)	1.80 (0.82)	13.646	<.001	-11.030	200.52	<.001
Hyperactivity	1.53 (0.34)	2.18 (0.37)	5.861	0.016	-7.295	281.38	<.001

Next, the prevalence of pre-existing diagnoses in each cluster was evaluated. The chi-square analysis results can be seen in Table 7. It is important to note that the analysis for differences in observations of ADHD - inattentive type, anxiety, and depression produced results with expected counts of less than 5. Therefore, Fishers exact p-value has been reported. There were no counts of ADHD – hyperactive type. The analysis indicates that children with a diagnosis of ADHD were over-represented cluster 2, other diagnoses were equally distributed between the clusters.

Table 7

Chi-Square Test Results for Analysis of Differences Between Cluster 1 and Cluster 2

Diagnosis	Cluster 1 <i>N (%)</i>	Cluster 2 <i>N (%)</i>	χ^2	df	<i>p</i>
ADHD – Inattentive	2 (1.69)	4 (2.08)			1.000
ADHD – Combined	47 (39.83)	51 (26.56)	5.951	1, 453	0.015
Anxiety	2 (1.69)	2 (1.04)			.637
Depression	1 (0.85)	0 (0)			.381

Chi-square tests were also used to compare the proportion of males and females in each cluster, and t-tests were used to compare the average age of participants in each cluster. These analyses revealed that there were no significant differences in age or gender between the individuals in cluster 1 and clusters 2. The results of the full analysis can be seen in Appendix K.

Discussion

Mapped Items

The mapping process whereby the measure items from the Conners 3 (Conners, 2008), the CCC-2 (Bishop, 2003), the RCADS-P (Chorpita et al., 2000), and the SDQ (Goodman, 1997) were mapped directly onto diagnostic criteria for anxiety, depression, and ADHD as outlined in the DSM-5 (APA, 2013). In total, a relatively small number of

measure items (70 out of 185 items) mapped directly onto at least one diagnostic criterion. There was a total of 13 items that mapped onto all three diagnoses, with an additional two items that mapped onto both ADHD and anxiety, and four items that mapped onto both anxiety and depression. The items that mapped onto all three diagnoses were characterised by over activity and restlessness, inattention and lack of concentration. This overlap in symptoms between all three diagnoses can be seen through inspection of the diagnostic criteria (APA, 2013) and is supported by previous research (Hallion et al., 2018; Koyuncu et al., 2022; Lundervault et al., 2016). The additional overlap between anxiety and ADHD was characterised by impulsivity and the lack of patience, which has also been reported on previously (APA, 2013; Weiss et al., 2011). Anxiety and depression were seen to overlap on items relating to sleep disturbances and fatigue. Again, this overlap in symptomology is highlighted in the diagnostic criteria (APA, 2013) and is supported by clinical research whereby sleep disturbances are present in individuals with both anxiety and depression alongside a bidirectional relationship between sleep disturbance and exacerbation of anxiety and depression (Alvaro et al., 2013). In summary, the results indicate an overlap between the three diagnostic categories. This is evidenced by subscale items on measures mapping onto incongruent diagnostic criteria (e.g. an item from a depression subscale mapping directly onto the criteria for anxiety) and from the number of items that map onto two or more diagnostic criteria.

Factors

The measure items that mapped onto diagnostic criteria revealed a six-factor model consisted of the following factors: Inattention, Separation Anxiety, Depression, General Anxiety, Social Anxiety and Hyperactivity.

The Inattention factor is characterised by difficulties with attention, concentration, organisation difficulties and restlessness. The Separation Anxiety factor is defined by difficulties with being alone and worrying about something bad happening to others or themselves. The Depression factor has items relating to lack of motivation, sadness, lack of enjoyment, lack of energy, appetite difficulties and feeling worthless.

The General Anxiety factor is categorised by excessive worry, especially in relation to getting or doing something wrong. The Social Anxiety factor is characterised by individuals having worries about others' opinions of them. The final factor is the Hyperactivity factor. This scale is characterised by being overactive, restless and impulsive.

The underlying factors support the traditional diagnostic framework as each factor aligned with existing DSM-5 criteria for the respective diagnoses (APA, 2013). These factors also support the subscales that can be found in RCADS-P (Chorpita et al., 2000) (Social Anxiety, Separation Anxiety, General Anxiety, Depression) and the subscales found in Conners-3 (Conners, 2008) (Inattention and Hyperactivity). Interestingly, although the factors represent discrete diagnoses and subscales, the items that combine to create the factors are from a mixture of the different measure subscales and diagnoses. For example, Depression contained subscale items relating to the General Anxiety, Separation Anxiety and Depression subscale items from the RCADS-P (Chorpita et al., 2000). This would further align with a transdiagnostic conceptualisation whereby the six diagnoses represented by the factors overlap in relation to criteria symptoms.

The six factors support research that ADHD, anxiety and depression are associated through overlap of symptoms (APA, 2013; de la Barra et al., 2013; Jarrett & Ollendick, 2008; Meinzer et al., 2014; Weiss et al., 2011; Yüce et al., 2013). In addition, the six-factors also support the association between the diagnoses of interest (ADHD, anxiety and depression) and other diagnoses identified (separation anxiety and social anxiety). In relation to the separation anxiety, research suggests that individuals with ADHD are more likely to experience separation anxiety than the general population, which has been linked to parenting styles and early life experiences and executive function difficulties, including a lack of impulse control (Jarrett & Ollendick, 2008; Vaughan et al., 2017). There are also associations with depression, for example, in a clinical sample of individuals with depression 41% also met the criteria for separation anxiety (Elbay et al., 2021). In relation to social anxiety, individuals with ADHD can

find it challenging to develop and maintain friendships, which may impact on individuals with ADHD experiencing social anxiety (Jarrett & Ollendick, 2008; Weiss et al., 2011). There has also been research to suggest there is a bidirectional relationship between the development and exacerbation of depression and social anxiety, as well as an overlap in symptoms (Gros et al., 2013; Stein et al., 2001). General anxiety is also associated with separation anxiety and social anxiety through underlying mechanisms of excessive worry and emotional regulation difficulties (APA, 2013; Counsell et al., 2017; Gros et al., 2013; Milrod et al., 2014). Furthermore, all diagnoses are linked through difficulties with inattention and concentration (APA, 2013).

Subgroups

The data-driven clustering identified subgroups of children with homogeneous profiles across the six factors. Two subgroups were identified: one group had an elevated profile, and one group had a non-elevated profile, portraying a severity split between the subgroups. The high severity subgroup had especially heightened levels of Inattention, General Anxiety, and Hyperactivity. There was also an elevation in Social Anxiety. The low severity subgroup had relatively elevated ratings of Inattention and General Anxiety with a slight elevation of Hyperactivity. The elevation of Anxiety, Inattention and Hyperactivity in both groups supports research on the associations between ADHD and anxiety which suggest a bidirectional relationship, an overlap in symptomology or underlying mechanisms, or joint risk factors (APA, 2013; Weiss et al., 2011).

Considering the traditional model of diagnosis with discrete categories, we would expect to see a subgroup with elevated levels for each factor that represents a diagnoses. For example, we would expect to see a group of individuals who experience high levels of depression, a subgroup of individuals who experience high levels of anxiety and a subgroup of individuals who experience high levels of ADHD symptomology. However, the data showed subgroups with similar patterns of elevation across the six factors with a severity split. This aligns with a transdiagnostic conceptualisation of ADHD, depression, and anxiety, in which elevated

symptomatology in one domain is associated with increased symptom severity in the others.

There were significant differences in gender and age between the two subgroups, with the elevated subgroup consisting of a younger age group with more boys. These differences in subgroups align with previous research that suggests that difficulties with externalising symptoms of hyperactivity/impulsivity, are more likely to be apparent when younger (Bathelt et al., 2021). Boys are also diagnosed with ADHD at a higher rate than girls (Gaub & Carlson, 1997; Klefsjö et al., 2021). This may be due to boys displaying more externalising symptoms than girls, and girls having to develop strategies for masking at earlier ages due to socially acceptable norms (Rucklidge, 2008). It is also important to note that the majority of the participants in the current study were male. This may impact on the current findings.

There were also significant differences in the number of individuals in the elevated and non-elevated subgroups from the referred sample. The elevated subgroup had a larger proportion of the referred sample, with the non-elevated subgroup containing a larger proportion of the comparison sample. This may have influenced the severity split observed. There were significant differences in the numbers of individuals diagnosed with combined ADHD and anxiety, with more diagnosed individuals in the elevated subgroup. If we consider a traditional diagnostic framework, we expect individuals with a particular diagnosis to be grouped in separate elevated groups relating to difficulties consistent with the relative diagnosis (e.g. all individuals with general anxiety in a subgroup with difficulties relating to anxiety). However, the majority of individuals with diagnoses are grouped together into one high severity group. This indicates that traditional diagnostic categories do not correctly capture the complexity of individuals' difficulties across the six factors, or that the diagnostic categories are associated with each other, further supporting a transdiagnostic framework.

Due to the possible influence of the proportion of referred sample and comparison sample in the resulting subgroups, another k-means cluster analysis was

completed. This analysis resulted in two subgroups again presenting with a severity split whereby one subgroup showed an elevated profile across all six factors. Both subgroups showed particularly elevated levels of Inattention, General Anxiety, Social Anxiety and Hyperactivity. No significant differences were observed in relation to age and gender. The only diagnosis that showed a significant difference between subgroups was individuals with an ADHD combined diagnosis were observed more in the elevated subgroup. We would expect there to be individuals with a diagnosis in the elevated subgroup, particularly in relation to ADHD, as these are the factors that show as most elevated. However, it is surprising that there was not a significant difference seen in individuals who were diagnosed with anxiety, as this was also a factor that was highly elevated. There were also no differences seen in other diagnoses. Due to the nature of the study including individuals regardless of diagnosis, there were very small incident rates of mental health diagnoses which mean the results of differences in diagnoses between the two clusters must be interpreted with caution.

Summary

The overall findings support the Transdiagnostic conceptualisation of mental health and neurodevelopmental conditions (Akkermans et al., 2019; Jacobs et al., 2021; Kuo et al., 2020). The current study provides support for the association between ADHD, anxiety and depression due to the overlap in symptomology and conceptualisation (Boylan et al., 2011; Brady & Kendall, 1992; Corbisiero et al., 2013; Di Nicola et al., 2014; Jarrett & Ollendick, 2008; Retz et al., 2012; Seligman & Ollendick, 1998). However, the shared risk factors and bidirectionality may increase the association seen in the current results (Cole et al., 2009; Epkins & Heckler, 2011; Michelini et al., 2015; Thapar et al., 2013; Weiss et al., 2011).

Limitations and Future Directions

The study included both a referred and a comparison group, with the referred group showing significantly higher scores across all measures (RCADS-P, SDQ, Conners, CCC-2). Participants were not excluded based on diagnosis, enabling a

transdiagnostic approach reflecting real-world symptom diversity. However, this introduced heterogeneity whereby some individuals in the comparison group may have had diagnoses, and some in the referred group may not. This variability may affect replication and skew findings. To address this, group differences were reported clearly, and a further cluster analysis validated patterns within the referred sample. Nonetheless, overlapping diagnoses may confound interpretation and obscure specific effects.

The analysis was completed using screeners that are based on the DSM-5 criteria (APA, 2013). It has been noted that the Conners-3 (Conners, 2008) and the RCADS-P (Chorpita et al., 2000) should not be used in isolation for the diagnosis and should only be used to guide clinicians in diagnosis (Chorpita et al., 2000; NICE, 2019). The current study supports the need for clinical judgement in relation to diagnosis due to the false negatives and false positives that may occur due to the overlap in symptoms as observed in the current study.

All measures in this study were parent-reported. While useful for predicting diagnoses, parent reports can be biased or subjective (Moore & Goodson, 2003; Richards et al., 2017; Nordahl-Hansen et al., 2014; Ozonoff et al., 2011). RCADS child self-report data was available, but parent-report was used consistently to reduce variability and include younger children who may struggle with self-report. Nonetheless, children provide insight into internal experiences that parents may miss, and self-report supports triangulation. Future research should incorporate child self-report to enhance accuracy and generalisability across informants and contexts.

Low inter-rater reliability posed another limitation. While the multidisciplinary backgrounds of the authors added valuable perspectives, differing theoretical and experiential frameworks may have influenced symptom interpretation, introducing potential bias. Several measure items referenced ADHD, anxiety, or depression indirectly or without clear alignment to DSM-5 criteria. To address this, a consensus-based approach was used, limiting inclusion to symptoms explicitly matching DSM-5 definitions. While this improved diagnostic consistency and reduced bias, it may have

excluded relevant or overlapping behaviours reflecting real-world complexity but falling outside strict diagnostic wording.

The measures contained behavioural and functional outcomes of difficulties that were not directly included in the criteria. There are also symptoms in the measures that are not listed in the criteria that clinicians regularly attribute to diagnoses, for example, the physical response to anxiety of nausea (McLeod et al., 1986). The inclusion of a broader and less defined definition of mental health and neurodevelopmental conditions may impact the overlap seen between the diagnoses and represent a more realistic conceptualisation. It would be interesting to explore these broader categories and include functional impacts of criteria in future research in order to understand how the overlap in symptomology impacts on individuals' daily life.

Methodological limitations are recognised in the current study. For example, the six-factor model was deemed the most appropriate model, however, the Chi-Squared goodness of fit was significant, and the Tucker-Lewis Index and Root Mean Square Error of Approximation were not in the acceptable range. This suggests the six-factor model was not a good fit for the data and, therefore, should be interpreted with caution. A further limitation of the study is the sample size. The resulting number of measure items compared to the sample size may have negatively impacted the power of the study. This may have contributed to the difficulties seen in relation to poor fit. It would be beneficial to complete the study with an increased sample size.

As noted earlier, there are racial and socioeconomic disparities in who gets a diagnosis (Evans-Lacko et al., 2018; Halvorsrud et al., 2019; Murali & Oyebo, 2004; Schwartz & Blankenship, 2014). An understanding of demographic differences in individuals who present with difficulties aids in broadening our understanding of neurodevelopmental conditions and mental health difficulties and has implications for appropriate and person-centred support. Therefore, further risk factors including cultural and socioeconomic demographics, would be important to explore in future research.

Clinical Implications

The current findings highlight the significant overlap between ADHD, anxiety, and depression, which often leads to diagnostic confusion, misidentification, and ineffective treatment (Pallanti & Salerno, 2020). Given the likelihood of co-occurring conditions or symptom misattribution, clinicians should adopt a person-centred approach that looks beyond diagnostic categories to consider the full spectrum of presenting difficulties (Boulton et al., 2021, 2023; Dennison et al., 2024).

This is especially critical in the early identification of ADHD, anxiety and/or depression. Delays in a diagnosis of ADHD can increase the risk of secondary difficulties, including anxiety, depression, and oppositional behaviours (Taylor, 2010). Timely and accurate recognition of ADHD, anxiety and depression enables earlier intervention, supporting emotional regulation, reframing behavioural concerns, and facilitating more effective academic and social support (Baughman et al., 2020; Brites et al., 2023). To improve diagnostic accuracy and early intervention, assessment protocols should be expanded to routinely screen for a broader range of emotional and behavioural symptoms using multiple informants (e.g., child, parent, teacher) and incorporate tools that are sensitive to transdiagnostic features. This would support more accurate formulation, earlier intervention, and better-targeted support.

Recent findings also highlight the need for research into and development of transdiagnostic interventions. There is growing recognition of the value of accessible approaches that span neurodevelopmental and mental health domains (Ogundele & Morton, 2022; Young et al., 2021). Adapted cognitive behavioural therapy (CBT), often delivered alongside medication, has been shown to reduce ADHD and internalising symptoms, improving quality of life (Cuijpers et al., 2013; Liu et al., 2023). Tailoring CBT to accommodate executive function differences and prioritise emotional regulation shows particular promise in transdiagnostic contexts (Ahmad et al., 2018; Sciberras et al., 2019).

Comorbid presentations are associated with greater functional impairment, treatment resistance, and elevated suicide risk (Biederman et al., 2008; Melton et al., 2016). Yet neurodevelopmental and mental health services often operate in silos,

resulting in fragmented care and limited post-diagnostic support, placing the burden on families to navigate these disjointed systems (Ogundele & Morton, 2022). The current findings, marked by significant symptom overlap and reciprocal escalation across domains, underscore the need for integrated, transdiagnostic service models and coordinated care pathways.

In summary, the findings underscore an urgent need for improved recognition, comprehensive assessment, and accessible interventions within integrated care pathways that address the complexity of comorbid and transdiagnostic presentations across neurodevelopmental and mental health domains.

Conclusion

In conclusion, there was seen to be an overlap between the diagnostic criteria for anxiety, depression, and ADHD. The current study advocates for a transdiagnostic conceptualisation of diagnosis for understanding the complexity and co-occurring nature of common mental health and neurodevelopmental conditions. These findings have clinical implications for service development and delivery as well as future research to ensure a more person-centred and flexible approach in which individual needs are considered.

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CHAPTER FIVE

Additional Methodology

Additional Chapter: Empirical Paper Methodology

The CALM Cohort Procedure

In the original study, children completed a battery of standardised neuropsychological assessments measuring cognition and learning, administered one-to-one with a researcher over 3 to 6 hours (with breaks and the option to split sessions across days). They also completed self-ratings of mental health. Parents or caregivers provided ratings of the child's behaviour, communication, and mental health. Participants were also invited to optional neuroimaging sessions within six months and to provide saliva samples for genetic analysis. Full procedural details are available in the study protocol (Holmes et al., 2019).

The original study collected cognitive, behavioural, learning, MRI, and genetic data. Cognitive tests included subtests from the Phonological Assessment Battery ([PhAB]; Frederickson et al., 1997), and the Children's Test of Nonword Repetition ([CNRep]; Baddeley & Gathercole, 1996), the Delis Kaplan Executive Function System ([DKEFS]; Delis et al., 2001), the Automated Working Memory Assessment ([AWMA]; Alloway, 2007), the Children's Memory Scale ([CMS]; Cohen, 1997), the Wechsler Abbreviated Scales of Intelligence II ([WASI-II]; Weschler, 2011), and the Test of Everyday Attention for Children 2 ([TEA-Ch2]; Manly et al., 2016). Measures related to learning included the Peabody Picture Vocabulary Test ([PPVT]; Dunn & Dunn, 2007), subtests from the Wechsler Individual Achievement Test II ([WIAT II]; Wechsler, 2005), and the Maths Fluency subtest from Woodcock Johnson III Test of Achievement ([WJ-III]; Woodcock et al., 2007). Behaviour measures included the Conners 3 (Conners, 2008), the Behaviour Rating Inventory of Executive Function ([BRIEF]; Gioia et al., 2000) and the Children's Communication Checklist, second edition ([CCC-2]; Bishop, 2003). Mental health measures included the Strengths and Difficulties Questionnaire ([SDQ]; Goodman, 1997), and the Revised Children's Anxiety and Depression Scale ([RCADS]; Chorpita et al., 2000).

Sample Size and Power

For exploratory factor analysis, guidelines suggest 10–15 participants per variable (Nunnally, 1978), with 300 considered a good sample size and 1000 excellent (Comrey & Lee, 1992). However, some research indicates that test parameters can remain stable with smaller ratios (Arrindell & van der Ende, 1985). While the current sample was adequate, a larger sample would strengthen validity. For cluster analysis, power depends more on subgroup distinctiveness than sample size, with $N=30$ per subgroup typically sufficient (Dalmajer et al., 2022). Nonetheless, the study may be underpowered for factor analysis and chi-square tests. Steps were taken to mitigate this, such as item reduction and use of less sample-sensitive tests, but findings should be interpreted cautiously and considered exploratory.

Ethical Considerations

Children and parents provided informed consent. Younger children were supported with sticker charts, and all participants received a small prize, with families reimbursed for time and travel. Data were anonymised, and participants could withdraw at any point up to initial analysis. Support resources were provided, and care was taken to minimise distress during assessments. If any measures indicated clinical concern (e.g., scores above diagnostic cut-offs), the referrer was notified to ensure appropriate follow-up.

Exploratory Factor Analysis

Exploratory factor analysis (EFA) was used to examine underlying factor structures without imposing a theoretical model, helping identify item groupings and reduce data complexity. Sampling adequacy was assessed using the Kaiser-Meyer-Olkin (KMO) and Bartlett's tests. The number of factors was determined through parallel analysis and scree plot inspection. Oblique (oblimin) rotation was applied, assuming interrelated factors, and Cronbach's alpha was used to assess factor reliability.

Given the ordinal nature of item responses, polychoric correlations were calculated using the 'polycor' and 'psych' packages in R. However, warnings indicated many zero-count cells in contingency tables, requiring continuity correction and

highlighting data sparsity. To address this and improve power, MICE imputation was performed, which resolved these issues. The original polychoric correlation matrix was non-positive definite, necessitating smoothing via the ‘cor.smooth’ function in R, a limitation that suggests potential instability, likely due to sparse data or multicollinearity. As a result, EFA findings should be viewed as preliminary, with factor loadings interpreted cautiously.

Following this, a Spearman’s rho matrix was used to identify highly correlated items ($r > .80$); in such cases, one item was removed. Subsequent EFAs on the reduced item set returned no warnings, but model fit indices (e.g., RMSEA, TLI, RMSR, χ^2) remained poor. Due to the large number of items and relatively small sample size, we chose to retain only measures commonly used in ADHD, anxiety, and depression assessments. This led to the exclusion of all SDQ (Goodman, 1997) and CCC-2 (Bishop, 2003) items. The final EFA was conducted on 50 items from the Conners-3 (Conners, 2008) and RCADS-P (Chorpita et al., 2000), representing the most clinically relevant domains.

Clustering Analysis

K-means clustering was used for its computational efficiency and ability to analyse large item-level datasets, with clusters defined by centroids allowing clear group characterization (Frades & Mattheisen, 2010; Landau & Ster, 2010). This method effectively identifies well-separated clusters. Ensuring internal consistency and minimizing bias from correlated items was essential for reliable network estimation. K-means assigns individuals to the nearest cluster centroid, producing compact, distinct clusters. However, cluster analysis is sensitive to initialization and the predetermined number of clusters (Frades & Mattheisen, 2010; Landau & Ster, 2010). Various methods guide cluster number selection, such as the gap statistic and sum of squares (Gower, 1967; Kaufman & Rousseeuw, 2009; Thinsungnoena et al., 2015). This study used the silhouette method to identify distinct, well-separated clusters (Rousseeuw, 1987).

CHAPTER SIX

Discussion and Critical Evaluation

Discussion and Critical Evaluation Chapter

The current thesis explored the characteristics and concepts of mental health, trauma and ADHD by examining symptomology that directly maps onto the criteria for the diagnoses as outlined in the DSM-5 (APA, 2013). The thesis explored the relationship between and within the diagnoses, with focused consideration on the overlap in symptomology. The following discussion and critical evaluation will consider: the thesis findings in relation to existing research, the strengths and limitations of the methodology and line of enquiry, theoretical and clinical implications of the work, future development ideas, personal reflections and overall conclusions.

Overview of Results in Relation to Existing Research

The current thesis supports an overlap between the diagnosis of ADHD and common mental health conditions, including anxiety, depression and trauma symptoms.

The first meta-analysis revealed an elevated prevalence of ADHD (23.4%) among children and adolescents who had been exposed to trauma. This figure is considerably higher than ADHD rates typically reported in the general population, suggesting a strong association between trauma exposure and the likelihood of receiving an ADHD diagnosis (NICE, 2024). The second meta-analysis found that trauma exposure was also elevated among individuals with an ADHD diagnosis, with a prevalence rate of 35% (Costello et al., 2002; Lewis et al., 2019). Notably, our sample included individuals up to age 25, in contrast to prior reviews focused only on those under 18. Together, these findings highlight a meaningful overlap between ADHD and trauma exposure, with rates in both directions exceeding general population expectations.

In the empirical paper, mapping measure items revealed limited direct alignment with ADHD, anxiety, and depression criteria in the DSM-5 (APA, 2013). From the results of the mapped measure items, it is apparent that there is an overlap between the three diagnostic categories. This is evidenced by subscale items on measures mapping onto incongruent diagnostic criteria (e.g. an item from a depression subscale mapping

directly onto the criteria for anxiety) and from the number of items that map onto two or more diagnostic criteria. From the mapped criteria, there were six underlying factors identified through exploratory factor analysis: Inattention, Separation Anxiety, Depression, General Anxiety, Social Anxiety, and Hyperactivity. The underlying factors support the traditional diagnostic framework as each factor aligned with existing DSM-5 criteria for the respective diagnoses (APA, 2013). These factors also support the subscales that can be found in RCADS-P (Chorpita et al., 2000) (Social Anxiety, Separation Anxiety, General Anxiety, Depression) and the subscales found in Conners-3 (Conners, 2008) (Inattention and Hyperactivity). However, although the factors represent discrete diagnoses and subscales, the items that combine to create the factors are from a mixture of the different measure subscales and diagnoses. For example, Depression contained subscale items relating to the General Anxiety, Separation Anxiety and Depression subscale items from the RCADS-P (Chorpita et al., 2000). This would further support a transdiagnostic conceptualisation whereby the six diagnoses represented by the factors overlap in relation to criteria symptoms. The cluster analysis, completed on individuals factor scores across the six domains, presented two subgroups of individuals. These subgroups were separated by a severity split across all six domains, instead of discrete categories of children with elevated levels of a singular diagnosis. This provided further support for the association between diagnoses and a transdiagnostic conceptualisation of ADHD, depression and anxiety.

The results of the current research both support the association seen between ADHD and trauma exposure (Biederman et al., 2013; Craig et al., 2020; Cuffe et al., 1994), and ADHD, anxiety and depression (Jarrett & Ollendick, 2008; Meinzer et al., 2014). The current research supports the explanation that there is an overlap in symptomology between ADHD and trauma (Spencer et al., 2016; Szymanski et al., 2011), and ADHD and common mental health difficulties (anxiety and depression) (Brady & Kendall, 1992; Seligman & Ollendick, 1998), aligning with a transdiagnostic conceptualisation of neurodevelopmental and mental health difficulties. However, some studies report limited associations (Ford et al., 2000; Wozniak et al., 1999), possibly due

to narrow diagnostic definitions. This study used broader inclusion criteria, which may explain differences.

Multiple psychosocial and environmental factors may contribute to the development or exacerbation of ADHD, trauma-related, anxiety, and depressive symptoms (Cole & Deater-Deckard, 2009; Michelini et al., 2015; Thapar et al., 2013). These risk factors may underlie co-occurring symptomology and warrant further investigation. One diagnosis may also act as a risk factor for another, intensifying symptom severity (Ford & Connor, 2009; Jarrett & Ollendick, 2008; Meinzer et al., 2014; Wehmeier et al., 2010). Longitudinal studies tracking transitions between ADHD and trauma-related symptoms, as well as broader mental health difficulties, would help clarify developmental trajectories (Lugo-Candelas et al., 2021; Murray et al., 2022; van Dyk et al., 2015).

In summary, the overlap of symptoms may be one component of the transdiagnostic framework for understanding the overlap between mental health and neurodevelopmental conditions.

Theoretical Implications

The results from the current study, supporting a transdiagnostic conceptualisation of mental health and neurodevelopmental conditions, aid in the understanding and conceptualisation of diagnosis, and the relationships between diagnoses. Transdiagnostic models offer an alternative to traditional diagnostic systems by clarifying overlaps and distinctions between diagnoses, reducing the need for multiple labels, and promoting more inclusive, person-centred care (Dalglish et al., 2020; Ehrenreich-May & Chu, 2013). They may help to capture the complexity of individuals and broaden access to support regardless of diagnostic category. However, transdiagnostic models still rely on the symptom structures of established psychiatric diagnoses. Emerging research suggests that when freed from traditional frameworks, these models may reveal more nuanced, empirically driven hierarchies and diverse theoretical structures (Dalglish et al., 2020; Mansell, 2019; Power & Dalglish, 2015).

Clinical Implications

The global prevalence rates of mental disorders in children and adolescents are estimated at 13.4% (Polanczyk et al., 2015), with the rates increasing over time (Piao et al., 2022), impacting on service provision and delivery (Cardoso & McHayle, 2024; McCrone et al., 2008). Several factors are implicated in relation to the increase including socioeconomic influences, lack of access to mental health and neurodevelopmental services, an increase in awareness of both neurodevelopmental and mental health conditions, and the global pandemic. Another factor that impacts the increase in mental health and neurodevelopmental conditions is the conceptualisation of diagnosis (Goodman & Poillion, 1992). The impact of these factors on mental health services in the UK has resulted in significant challenges, including increased demand, long waiting times, lack of inpatient services, and lack of funding and resources (Henshaw, 2024). In addition, fractured mental health services, with different services having contrasting thresholds for referrals, often leaving individuals with co-occurring needs, or those below thresholds, unsupported (Ogundele & Morton, 2022). Individuals with comorbid diagnoses have more significant adverse outcomes, including increased and repetitive access of mental health services, increased suicide attempts, greater functional impacts, and an overall lower quality of life (Karlsson et al., 2006; Lewinshon et al., 1995; Newman et al., 1998).

In relation to clinical implications, transdiagnostic conceptualisations of mental health, neurodevelopmental conditions and trauma would be particularly pertinent to the process of accurate assessment, appropriate interventions and integrated service delivery with co-ordinated care pathways.

Primary care professionals, including educators and GPs, play a key role in identifying ADHD, as they are often the first to notice learning, mental health, or neurodevelopmental difficulties. Current guidelines recommend cross-professional training from specialist ADHD services (NICE, 2019; Young et al., 2021), yet many lack sufficient knowledge and training (Adamis et al., 2024; French et al., 2019; Russell et al., 2016; Tatlow-Golden et al., 2016). This gap extends to the recognition and

management of common mental health issues, such as anxiety, depression, and trauma, particularly in cases of comorbidity, increasing the risk of misdiagnosis and inadequate care (Greene et al., 2016; Richards et al., 2004; Sinnema et al., 2018; Tylee & Walters, 2006). Evidence supports the value of targeted training to improve identification and management across neurodevelopmental and mental health domains (Copens et al., 2018; French et al., 2018; Shehata et al., 2016; Sinnema et al., 2015; Stephan et al., 2013).

The results of the current research indicate that it is also important for transdiagnostic conceptualisations to be considered in relation to assessment in secondary care and specialist services. Clinicians should explore all diagnoses when a young person presents with ADHD symptoms, and/or symptoms relating to trauma, anxiety and depression, as it is likely that there are multiple diagnoses present, or one condition could be misdiagnosed as another (Boulton et al., 2021; Boulton et al., 2023; Cuffe et al., 1994; Dennison et al., 2023; Ford et al., 2000; Harris et al., 2017; Schilpzand et al., 2018; Szymandk et al., 2011; Walker et al., 2021; Weinstein et al., 2000; Wozniak et al., 1999). This supports a shift away from rigid diagnostic boundaries toward a more flexible, person-centred approach across all tiers of care.

The findings of the current study also highlight the importance of developing and implementing interventions that address transdiagnostic symptoms and co-occurring neurodevelopmental and mental health difficulties. These transdiagnostic interventions move away from disorder-specific treatments towards approaches that target shared underlying mechanisms across multiple conditions. Research supports the effectiveness of transdiagnostic approaches in reducing a wide range of mental health symptoms (Anderson et al., 2016; Newby et al., 2015). For instance, transdiagnostic cognitive behavioural therapy (CBT) has been shown to be effective for treating comorbid anxiety and depression (Craske, 2012; Cuijpers et al., 2023; Garcia-Escalera et al., 2016). In children and young people with ADHD, interventions tailored to target both ADHD and internalising symptoms have led to improvements in symptom reduction, quality of life, and parental mental health (DeFilippis & Wagner, 2014;

Gould et al., 2018; Sciberras et al., 2018). As transdiagnostic models and interventions continue to evolve, further research is needed to explore their long-term impact, particularly in supporting individuals with both neurodevelopmental and mental health challenges. One of the key advantages of transdiagnostic interventions is their ability to offer a person-centred, flexible approach, particularly beneficial for individuals with complex or comorbid presentations.

Despite evidence supporting both the high comorbidity between neurodevelopmental conditions and mental health difficulties, and the effectiveness of transdiagnostic interventions, service provision for individuals with these co-occurring needs remains fragmented and limited, with many not receiving appropriate support (Ogundele & Morton, 2022; Young et al., 2021). The current findings support the development of future service models that prioritise integrated, transdiagnostic care pathways, enabling continuity of care across primary, secondary, and specialist services, from initial recognition through to assessment and intervention.

Strengths and Limitations

The current research aimed to explore symptoms in a diverse sample of children and adolescents to map characteristics of ADHD, trauma-related symptoms, anxiety, and depression. A key strength is the inclusion of individuals with a broad range of symptomatology, regardless of diagnosis. Recent transdiagnostic models suggest that trauma, common mental health conditions, and neurodevelopmental difficulties may lie on a continuum rather than representing discrete categories (Krupnik, 2020; Heidbreder, 2015; Siddaway et al., 2018). The meta-analysis examined trauma-exposed children and adolescents, irrespective of PTSD diagnosis, and included various trauma types, reflecting evidence that different traumas can lead to similar post-traumatic symptoms (Amstadter & Vernon, 2008; Langevin et al., 2023; Spencer et al., 2016). Similarly, the CALM dataset (Holmes et al., 2019) used in the empirical study involved a large transdiagnostic sample of children with difficulties in learning, memory, and/or attention, regardless of formal diagnosis. This approach captures individuals whose symptoms cause functional impairments but fall below diagnostic thresholds, an often-

overlooked group in both research and service provision (Coghill & Sonuga-Barke, 2012). Thus, a major strength of the research is its focus on broad symptom dimensions within transdiagnostic and subthreshold populations, supporting the need for inclusive and nuanced models of assessment and intervention.

In contrast, we took the decision to limit the research area in the meta-analysis to only include studies where individuals had received an ADHD diagnosis. This diagnosis had to be received through an interview with a trained individual, or a medical professional. This decision was influenced by National Institute for Health and Care Excellence (NICE) Guidelines stating that ADHD diagnosis should be made by a specialist psychiatrist, paediatrician or other appropriately qualified healthcare professional and never solely on the basis of rating scales or observational data (NICE, 2018). The inclusion of ADHD criteria being met by clinical interview meant the meta-analysis was robust. However, we recognise that instead of the discrete diagnoses that are described in the DSM-5, recent literature conceptualises ADHD as a continuum (Heidbreder, 2015). This alternative conceptualisation may mean individuals who have elevated levels of ADHD but without a diagnosis are missed in our analysis.

Another potential limitation of the current research is the constraints of traditional diagnostic frameworks underpinning the exploration into the overlap between neurodevelopmental conditions, mental health and trauma. As stated by Dalgleish and colleagues (2020), the research into transdiagnostic models are constrained by methodology that encompasses pre-existing psychiatric frameworks. In the meta-analysis the constructs of trauma and ADHD were defined by diagnostic criteria in the DSM-5 (APA, 2013). Similarly, the empirical paper contained measures that were based on the DSM-5 criteria for anxiety, depression and ADHD (APA, 2013; Bishop, 2003; Chorpita et al., 2000; Conners, 2008; Goodman, 1997). By including a broader and less distinctly defined array of challenges that fall outside the specific criteria for trauma, mental health, and neurodevelopmental conditions, it may be possible to develop an alternative hierarchical transdiagnostic model. These models, grounded in different theoretical foundations, could potentially provide a more precise

representation of the difficulties experienced by children and adolescents (Dalglish et al., 2020).

Systematic Review and Meta-Analysis

In addition to the previous strengths, the meta-analysis was robust in design. As mentioned earlier, the inclusion of diagnosed ADHD through meeting the DSM-5 or ICD-11 diagnostic criteria via a clinical interview meant the meta-analysis enhanced the robustness of the research (APA, 2013; World Health Organization [WHO], 2022). A further strength was the rigorous screening procedure; all studies were double screened at both abstract and title stage and at the full-text screening stage, with all disagreements being discussed by a further two researchers to come to a decision.

Regarding the meta-analysis, our decision to exclude studies that included a breakdown of different types of trauma, without an overall N of individuals exposed to trauma, may be a limitation. This decision meant that there were studies that were excluded that could have valuable information about different types of trauma. It may be interesting to complete further analysis on specific types of trauma that extended beyond the interpersonal violence and non-interpersonal violence that were explored in the current study. A further potential limitation relates to the challenges completing a meta-analysis in general. There are considerable differences in study designs, populations and sampling tools used in different studies, and this heterogeneity can lead to difficulties in combining the results and lead to misleading conclusions (Thomson, 1994).

Empirical Paper

A key strength of the current study was the use of validated measures, including the SDQ (Goodman, 1997), CCC-2 (Bishop, 2003), Conners-3 (Conners, 2008), and RCADS-P (Chorpita et al., 2000), all of which demonstrate strong test-retest reliability, internal consistency, and discriminant validity in clinical and non-clinical populations (Becker et al., 2019; Conners et al., 2008; Ebesutani et al., 2010, 2011; Goodman, 2001; Izzo et al., 2019; Nowell et al., 2022; Wellnitz et al., 2021). The Conners-3 and

RCADS-P were used in the final analysis and are known to have moderate to excellent diagnostic value for children with ADHD, commonly used in UK CAMHS (Baron et al., 2021; Becker et al., 2019; Chang et al., 2016). Parent-report measures are also considered more reliable for younger children (Becker et al., 2017; Bied et al., 2018; Ebesutani et al., 2015).

Another strength was the rigorous mapping process: each researcher (AD, JH, EB) independently mapped measure items to DSM-5 diagnostic criteria, with disagreements resolved through discussion. Additionally, the use of exploratory factor analysis enabled unbiased identification of item clusters (Schmitt, 2011), with confirmatory factor analysis recommended for future studies to test defined constructs. K-means cluster analysis provided a useful method for exploring item-level data, enabling examination of group characteristics through centroid-based clusters (Frades & Mattheisen, 2010; Landau & Ster, 2010). While k-means is effective for identifying well-separated groups, future studies could extend the analysis using community detection methods to investigate network structure and connectivity (Arinik et al., 2021).

Despite its contributions, the empirical study had several methodological limitations. Although the Conners-3 (Conners, 2008) and RCADS-P (Chorpita et al., 2000) are validated and reliable measures, they were analysed as deconstructed screening tools rather than diagnostic assessments aligned with clinical manuals (NICE, 2018), which may have compromised measurement stability (Cook & Beckman, 2006). Moreover, relying solely on parent-report limits screening accuracy, as multi-informant approaches are generally more robust (Mulraney et al., 2021). As a result, findings were interpreted cautiously, with a focus on symptom profiles rather than formal diagnoses.

The CALM dataset also presented constraints, including the absence of comprehensive neurodevelopmental or mental health assessments. Missing data were addressed using multiple imputation (Van Buuren & Groothuis-Oudshoorn, 2011), but this introduces its own assumptions. Exploratory factor analyses were further limited by sample size, variable count, and interpretive subjectivity (Ford et al., 1986; Howard,

2016), although the sample size met established thresholds (Arrindell & van der Ende, 1985; Comrey & Lee, 1992; Nunnally, 1978). Given that CALM participants were referred for learning, memory, or attention difficulties, with approximately one-third diagnosed with ADHD, the findings may not generalise beyond similar clinical populations. Additionally, the factor model demonstrated suboptimal fit, reinforcing the need for cautious interpretation.

Future Research

In relation to the meta-analysis conducted into the prevalence rates of comorbid ADHD and trauma exposure, it would be interesting to explore the different types of trauma, with corresponding prevalence rates of ADHD. Such an investigation could feasibly give an indication of risk factors for the development of ADHD. In relation to transdiagnostic models and conceptualising neurodevelopmental difficulties and trauma symptomology as a continuum, it would be beneficial to include studies that have ADHD and trauma symptomology ratings. This could help to identify whether the severity of symptoms has an impact on the prevalence rates and severity of the corresponding diagnosis. For example, whether individuals who had higher ratings of trauma symptoms provided a higher rating of ADHD symptomology.

There was no scope in the current studies to explore in depth whether further risk factors that may impact on symptomology or diagnosis. Understanding risk factors for different symptomology/diagnoses in relation to comorbidity allows for early identification and possible mitigation of the development or the exacerbation of symptomology (Cuijpers et al., 2006; Neil & Christensen, 2007). It would be especially important to explore the demographics of transdiagnostic samples to provide an understanding of difficulties in populations that have not previously accessed mental health services or met thresholds to receive support, due to this population being underrepresented in research. For example, race and socioeconomic status can impact on access to mental health services and diagnosis (Evans-Lacko et al., 2018; Halvorsrud et al., 2019; Murali & Oyeboode, 2004; Schwartz & Blankenship, 2014).

The CALM cohort study provides data sets across multiple domains that could be useful in further researching the factors and clusters identified in the current research. Understanding the different cognitive profiles that correspond to each cluster would help in characterising the clusters. For example, deficits in executive functioning skills have been linked to ADHD symptomology in adolescents, especially in relation to inattention (Martel et al., 2007). It would be interesting to see how the cognitive profiles map onto the data-driven clusters. It is important to highlight that the individuals who provided data were referred due to learning, memory and/or attention difficulties; as we have also explored mental health symptomology, it would be important to complete similar research in other clinical and typically developing populations. This would allow for a broader understanding of how characteristics map across symptomology of common neurodevelopmental conditions, mental health difficulties and trauma-related symptoms.

Overall, continued research into the overlap of ADHD with mental health conditions and trauma would enhance understanding of transdiagnostic conceptualisations and inform service development that better meets the needs of children and adolescents (Fusar-Poli et al., 2019). Future studies could adopt designs that capture empirically driven, theoretically diverse difficulties beyond pre-existing psychiatric frameworks.

Personal Reflections

Clinical psychologists rely on formulation to guide understanding and decision-making. Yet, research, diagnosis, and intervention guidelines remain rooted in medicalised, categorical systems (APA, 2013; NICE, 2018, 2019). During this doctorate, I've often felt like an 'imposter' (Clance & Imes, 1978), particularly when working with individuals whose experiences didn't align neatly with diagnostic categories. Engaging with this research has been validating, highlighting the complexity and overlap between ADHD, trauma, and mental health. It deepened my understanding of shared symptoms, comorbidity, and the bi-directional relationships between diagnoses and risk factors. This has enriched my clinical practice, allowing me to

approach assessment, formulation, and intervention with greater openness to transdiagnostic presentations and co-occurring conditions. I now feel more confident navigating diagnostic complexity and tailoring care to the individual.

Although completing the thesis portfolio was initially daunting, I have thoroughly enjoyed the research process. Balancing it with placements allowed me to see the direct benefits of the scientific practitioner approach (Jones & Mehr, 2007). Using new methodologies, collaborating with experienced researchers, supporting students, and being seen as a clinical expert was challenging at first. However, I now feel more confident in my research skills, theoretical knowledge, and clinical expertise. This experience has deepened my passion for research, particularly its potential to inform policy and improve service delivery. Presenting my findings in clinical settings has further highlighted the importance of research conducted by clinical psychologists.

Conclusion

This portfolio explores the relationship between ADHD and common mental health difficulties. The results support the evidence of the relationship between ADHD and depression and anxiety. The results also support an association between trauma and ADHD whereby individuals who are exposed to trauma have a higher prevalence rate of ADHD, and the prevalence of trauma exposure in individuals with ADHD is higher than the general population. The reasons behind the heterogeneity and comorbidity of ADHD and depression and anxiety, and ADHD and trauma exposure are discussed. The portfolio explores how the findings relate to modern conceptualisations of mental health with transdiagnostic frameworks where symptoms occur on a continuum. Implications include updated service provision with a focus on integration of services, enhanced training, in-depth assessment processes, and appropriate intervention. Future research exploring transdiagnostic models of neurodevelopmental conditions and mental health symptoms is required to provide a deeper understanding of our conceptualisation of these difficulties in order to increase appropriate person-centred support for children and adolescents.

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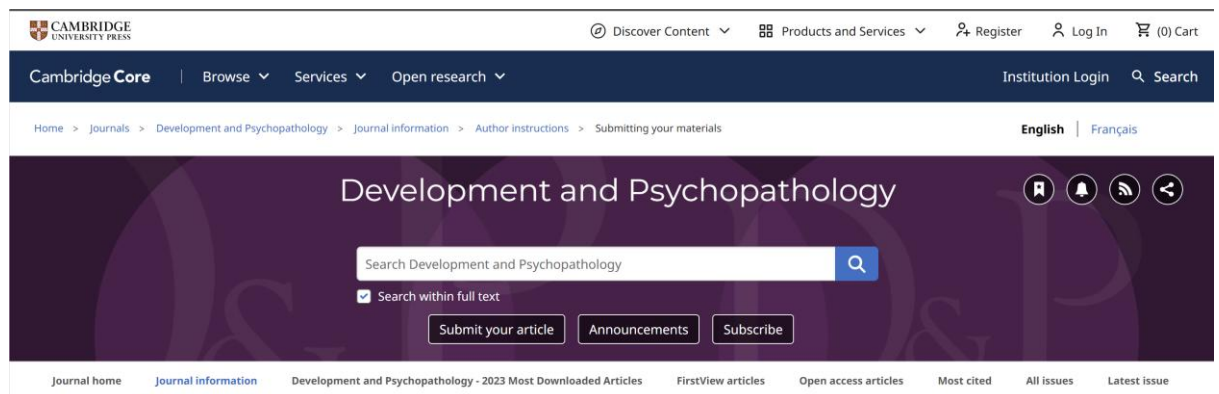
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Appendix A

Author Guidelines for Development and Psychopathology



Preparing your materials

Development and Psychopathology strongly encourages contributions from a wide array of disciplines because an effective developmental approach to psychopathology necessitates a broad synthesis of knowledge. Manuscripts will be considered that address, for example, the causes and effects of genetic, neurobiological, biochemical, cognitive, or socioemotional factors in developmental processes with relevance to various risk or psychopathological conditions. The journal also seeks articles on the processes underlying the adaptive and maladaptive outcomes in populations at risk for psychopathology.

Manuscript Preparation and Style

General. All manuscripts must be provided in MSWord format in 12-point type with 1-in. margins on all sides. The entire manuscript must be double-spaced and numbered consecutively. The language of publication is English.

Style and Manuscript Order. Follow the general style guidelines set forth in the *Publication Manual of the American Psychological Association* (7th ed.). The Editor may find it necessary to return manuscripts for reworking or retyping that do not conform to requirements. Do not use embedded references, end notes, or bookmarks. Manuscripts must be arranged in the following order:

Title Page. **To facilitate blind review, all indication of authorship must be limited to this page, which should be submitted as a separate file. Other pages must only show the short title plus page number at the top right.** The title page should include the (a) full article title; (b) name and affiliations of all authors; (c) acknowledgments; (d) mailing address and telephone number of the

corresponding author; (e) address of where to send offprints, if different from the corresponding author; and (f) a short title of less than 50 characters.

Acknowledgments. These should be placed below the affiliations. Use this section to indicate grant support, substantial assistance in the preparation of the article, or other author notes.

Abstract Page. Include (a) a full article title, (b) an abstract of no more than 200 words, and (c) up to five keywords for indexing and information retrieval.

Text. Use a standard paragraph indent. Do not hyphenate words at the ends of lines or justify right margins.

References. Bibliographic citations in the text must include the author's last name, date of publication, DOI and may include page references. Examples of in-text citation style are Cicchetti (2002), Durston (2008, pp. 1133–1135), Hunt and Thomas (2008), (Hunt & Thomas, 2008), (Posner, Rothbart, Sheese, & Tang, 2007), and subsequently (Posner et al., 2007). If more than one, citations must be in *alphabetical* order. Every in-text citation must be included in the reference section; every reference must be cited in the text. Examples of reference styles:

Journal Article Haltigan, J., Roisman, G., & Fraley, R. (2013). The predictive significance of early caregiving experiences for symptoms of psychopathology through midadolescence: Enduring or transient effects? *Development and Psychopathology*, 25(1), 209–221. doi:10.1017/S0954579412000260

Book Buss, A., & Plomin, R. (1984). *Temperament: Early developing personality traits*. Hillsdale, NJ: Erlbaum.

Chapter in an Edited Book Gottlieb, G., & Willoughby, M. T. (2006). Probabilistic epigenesis of psychopathology. In D. Cicchetti & D. Cohen (Eds.), *Developmental psychopathology* (Vol. 1, 2nd ed., pp. 673–700). Hoboken, NJ: Wiley.

Appendix (optional). Use only if needed.

Tables. Tables must be submitted as a separate MSWord file. Each table should begin on a separate page, and be typed double-spaced, numbered consecutively with an Arabic numeral, and given a short title (e.g., Table 5. Comparisons on language variables). All tables must be clearly cited in the text, and must be clearly labeled at the location they are to appear, e.g. "TABLE ONE HERE".

Figures. Figures must also be submitted as separate files, in either .TIFF or .JPG format. Each figure must be numbered consecutively with an Arabic numeral and a descriptive legend. Legends must be provided separately from the artwork (e.g.,

Figure 3. The progress in language development). Figures should be no larger than 6 × 9 in. Diagrams must be computer generated. All labels and details must be clearly presented and large enough to remain legible at a 50% reduction. Artwork should be identified by figure number and short title. All figures must be cited in the text, and their location labeled in the same manner as Tables.

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Appendix B

Author Guidelines for Research on Child and Adolescent Psychopathology



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Appendix C

Ethical Approval from University of East Anglia

University of East Anglia

Study title: Mapping Characteristics of Mental Health and Neurodevelopmental Conditions During Childhood and Adolescence

Application ID: ETH2324-0329

Dear Abigail,

Your application was considered on 30th October 2023 by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee).

The decision is: **approved**.

You are therefore able to start your project subject to any other necessary approvals being given.

If your study involves NHS staff and facilities, you will require Health Research Authority (HRA) governance approval before you can start this project (even though you did not require NHS-REC ethics approval). Please consult the HRA webpage about the application required, which is submitted through the [IRAS](#) system.

This approval will expire on **31st October 2025**.

Please note that your project is granted ethics approval only for the length of time identified above. Any extension to a project must obtain ethics approval by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) before continuing.

It is a requirement of this ethics approval that you should report any adverse events which occur during your project to the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) as soon as possible. An adverse event is one which was not anticipated in the research design, and which could potentially cause risk or harm to the participants or the researcher, or which

reveals potential risks in the treatment under evaluation. For research involving animals, it may be the unintended death of an animal after trapping or carrying out a procedure.

Any amendments to your submitted project in terms of design, sample, data collection, focus etc. should be notified to the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) in advance to ensure ethical compliance. If the amendments are substantial a new application may be required.

Approval by the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee) should not be taken as evidence that your study is compliant with the UK General Data Protection Regulation (UK GDPR) and the Data Protection Act 2018. If you need guidance on how to make your study UK GDPR compliant, please contact the UEA Data Protection Officer (dataprotection@uea.ac.uk).

Please can you send your report once your project is completed to the FMH S-REC (fmh.ethics@uea.ac.uk).

I would like to wish you every success with your project.

On behalf of the FMH S-REC (Faculty of Medicine and Health Sciences Research Ethics Subcommittee)

Yours sincerely,

Dr Paul Linsley

Ethics ETH2324-0329 : Miss Abigail Davies

Appendix D

Results of Mapping the Measure Items onto Diagnostic Criteria

Table D1

Measure Items That Map Onto the Diagnostic Criteria for Depression

<i>Questionnaire</i>	<i>Item Number</i>	<i>Item</i>
CCC	52	NEGATIVE Reacts positively when a new and unfamiliar activity is suggested
SDQ	2	Restless, overactive, cannot stay still for long
SDQ	10	Constantly fidgeting or squirming
SDQ	13	Often unhappy, down-hearted or tearful
SDQ	15	Easily distracted, concentration wanders
SDQ	25	NEGATIVE Sees tasks through to the end, good attention span
Conners	3	Fidgets or squirms in seat
Conners	5	Restless or overactive
Conners	9	Is difficult to please or amuse
Conners	11	Is hard to motivate (even with rewards like candy or money)
Conners	13	Acts as if driven by a motor
Conners	16	Is happy, cheerful, and has a positive attitude
Conners	24	Is constantly moving.
Conners	27	Has a short attention span.
Conners	30	Has trouble concentrating.
Conners	34	Inattentive, easily distracted.

Conners	41	Has trouble keeping his. Her mind on work or on play for long.
RCADS-P	2	feels sad or empty
RCADS-P	6	feels nothing is much fun anymore
RCADS-P	11	has trouble sleeping
RCADS-P	15	has problems with appetite
RCADS-P	19	has no energy for things
RCADS-P	21	feels tired a lot
RCADS-P	25	cannot think clearly
RCADS-P	29	feels worthless
RCADS-P	37	thinks about death
RCADS-P	40	feels like doesn't want to move
RCADS-P	47	feels restless

Note. 28 items (1 CCC-2 [Bishop, 2003] item [1.43% of total measure], 5 SDQ [Goodman, 1997] items [20% of total measure], 11 Conners-3 [Conners, 2008] items [25.58% of total measure], 11 RCADS-P [Chorpita et al., 2000] items [23.4% of total measure]).

Table D2

Measure Items That Map Onto the Diagnostic Criteria for Anxiety

<i>Questionnaire</i>	<i>Item Number</i>	<i>Item</i>
SDQ	2	Restless, overactive, cannot stay still for long
SDQ	8	Many worries, often seems worried
SDQ	10	Constantly fidgeting or squirming
SDQ	15	Easily distracted, concentration wanders

SDQ	16	Nervous or clingy in new situations, easily loses confidence
SDQ	24	Many fears, easily scared
SDQ	25	NEGATIVE Sees tasks through to the end, good attention span
Conners	3	Fidgets or squirms in seat
Conners	5	Restless or overactive
Conners	13	Acts as if driven by a motor
Conners	17	Doesn't pay attention to details; makes careless mistakes
Conners	24	Is constantly moving.
Conners	27	Has a short attention span.
Conners	30	Has trouble concentrating.
Conners	34	Inattentive, easily distracted.
Conners	37	NEGATIVE Is patient and content, even when waiting in a long line.
Conners	41	Has trouble keeping his. Her mind on work or on play for long.
RCADS-P	1	worries about things
RCADS-P	4	worries when does poorly at things
RCADS-P	5	fears being alone at home
RCADS-P	7	scared to take a test
RCADS-P	8	feels worried when someone angry
RCADS-P	9	fears being away from parents
RCADS-P	11	has trouble sleeping

RCADS-P	12	worries will do badly at school work
RCADS-P	13	worries something awful will happen to family
RCADS-P	17	scared to sleep alone
RCADS-P	18	trouble going to school
RCADS-P	19	has no energy for things
RCADS-P	20	worries might look foolish
RCADS-P	21	feels tired a lot
RCADS-P	22	worries bad things will happen to self
RCADS-P	25	cannot think clearly
RCADS-P	27	worries something bad will happen to self
RCADS-P	30	worries about mistakes
RCADS-P	32	worries what others think
RCADS-P	33	afraid of being in crowded places
RCADS-P	34	suddenly feels really scared for no reason
RCADS-P	35	worries about what will happen
RCADS-P	38	afraid to talk in front of class
RCADS-P	41	worries will suddenly get scared for no reason
RCADS-P	43	afraid of looking foolish in front of people
RCADS-P	45	worries in bed at night
RCADS-P	46	scared to sleep away from home
RCADS-P	47	feels restless

Note. 45 Items (7 SDQ [Goodman, 1997] items [28% of total measure], 10 Conners-3 [Conners, 2008] items [23.26% of total measure], 28 RCADS-P [Chorpita et al., 2000] items [59.57% of total measure]).

Table D3

Measure Items That Map Onto the Diagnostic Criteria for ADHD

<i>Questionnaire</i>	<i>Item Number</i>	<i>Item</i>
CCC	5	Talks repetitively about things that no-one is interested in
CCC	7	With familiar adults, seems inattentive, distant or preoccupied
CCC	34	Takes in just 1-2 words in a sentence, and so misinterprets what has been said. E.g. if someone says "I want to go skating next week", s/he may think they've been skating, or want to go now
CCC	35	It's difficult to stop him/her from talking
CCC	59	NEGATIVE Keeps quiet in situations where someone else is trying to talk or concentrate (e.g. when someone else is watching TV, or during formal occasions such as school assembly or a religious ceremony)
SDQ	2	Restless, overactive, cannot stay still for long
SDQ	10	Constantly fidgeting or squirming
SDQ	15	Easily distracted, concentration wanders
SDQ	25	NEGATIVE Sees tasks through to the end, good attention span
Conners	1	Forgets to turn in completed work
Conners	3	Fidgets or squirms in seat
Conners	5	Restless or overactive
Conners	7	Runs or climbs when he/she is not supposed to

Conners	12	Makes mistakes
Conners	13	Acts as if driven by a motor
Conners	15	Has trouble getting started on tasks or projects
Conners	17	Doesn't pay attention to details; makes careless mistakes
Conners	20	Loses things (for example, schoolwork, pencils, books, tools, or toys).
Conners	24	Is constantly moving.
Conners	27	Has a short attention span.
Conners	28	Excitable, impulsive.
Conners	30	Has trouble concentrating.
Conners	32	Has trouble organizing tasks or activities.
Conners	34	Inattentive, easily distracted.
Conners	35	Is messy or disorganized.
Conners	37	NEGATIVE Is patient and content, even when waiting in a long line.
Conners	41	Has trouble keeping his/her mind on work or on play for long.
Conners	42	Has to struggle to complete hard tasks.
RCADS-P	47	feels restless

Note. Measure items that map onto the diagnosis of ADHD: 29 Items (5 CCC-2 [Bishop, 2003] items [7.14% of total measure], 4 SDQ [Goodman, 1997] items [16% of total measure], 19 Conners-3 [Conners, 2008] items [44.19% of total measure], 1 RCADS-P [Chorpita et al., 2000] item [2.13% of total measure]).

Table 4.

Overlapping Measure Items

<i>Diagnoses</i>	<i>Number of Items Overlapping</i>	<i>Questionnaire/Item Numbers</i>
ADHD + Anxiety	16	SDQ2, SDQ10, SDQ15, SDQ25, Conners3, Conners5, Conners13, Conners17, Conners24, Conners27, Conners30, Conners34, Conners37, Conners41, RCADSP47, RCADSC24
ADHD + Depression	14	SDQ2, SDQ10, SDQ15, SDQ25, Conners3, Conners5, Conners13, Conners24, Conners27, Conners30, Conners34, Conners41, RCADSP47, RCADSC24
Anxiety + Depression	22	SDQ2, SDQ10, SDQ15, SDQ25, Conners3, Conners5, Conners13, Conners24, Conners27, Conners30, Conners34, Conners41, RCADSP11, RCADSP19, RCADSP21, RCADSP25, RCADSP47, RCADSC8, RCADSC13, RCADSC15, RCADSC21, RCADSC24
ADHD + Anxiety + Depression	14	SDQ2, SDQ10, SDQ15, SDQ25, Conners3, Conners5, Conners13, Conners24, Conners27, Conners30, Conners34, Conners41, RCADSP47, RCADSC24

Appendix E

Fit Indices for the resulting factor models from exploratory factor analysis

Table E1

Fit Indices for Each Factor Model

	Chi Square	df	p	RMSR	TLI	RMSEA	CI	BIC
7FM	44783.18	1946	<0	0.03	0.236	0.22	0.219, 0.222	32881.65
6FM	45431.58	2010	<0	0.03	0.311	0.218	0.217, 0.22	33138.64
5FM	46295.88	2075	<0	0.04	0.318	0.217	0.215, 0.215	33605.41
8FM Items Removed	7291.31	1370	<0	0.03	0.7	0.098	0.096, 0.1	-1087.46
7FM Items Removed	7802.65	1424	<0	0.03	0.69	0.099	0.097, 0.102	-906.38
6FM Items Removed	8354.61	1479	<0	0.04	0.679	0.101	0.099, 0.104	-690.79
5FM Items Removed	8965.34	1535	<0	0.04	0.666	0.103	0.101, 0.106	-422.55
7FM Measures Removed	4953.37	896	<0	0.03	0.732	0.1	0.097, 0.103	-526.47
6FM Measures Removed	5343.31	940	<0	0.03	0.724	0.102	0.099, 0.104	-405.63
5FM Measures Removed	5937.78	985	<0	0.04	0.704	0.105	0.103, 0.108	-86.37

Appendix F

Rotated Factor Loadings for Exploratory Factor Analysis Models – All measure Items

Table F1

Rotated Factor Loadings for the Seven-Factor Model – All Measures

	PA1	PA5	PA2	PA4	PA7	PA3	PA6
ccc2_5	0.232	0.362	0.065	0.049	0.101	0.129	0.197
ccc2_7	0.390	0.112	-0.146	0.262	-0.043	0.212	0.160
ccc2_34	0.408	0.298	-0.030	0.034	-0.035	0.182	0.205
ccc2_35	0.200	0.463	0.060	-0.086	0.117	0.204	0.067
ccc2_52	0.098	0.038	0.028	0.384	-0.049	0.108	0.217
ccc2_59	0.266	0.428	-0.141	0.099	0.013	0.147	0.212
sdq2	0.274	0.667	-0.043	0.100	0.120	-0.067	0.075
sdq8	-0.119	0.060	0.346	0.328	0.148	0.071	0.364
sdq10	0.300	0.610	-0.037	0.034	0.041	-0.012	0.190
sdq13	-0.157	0.188	0.244	0.549	0.122	-0.055	0.180
sdq15	0.594	0.264	0.011	0.098	0.094	-0.082	0.227
sdq16	0.159	-0.056	0.083	0.092	0.174	-0.052	0.625
sdq24	-0.081	-0.028	0.122	0.134	0.330	0.105	0.514
sdq25	0.671	0.155	0.001	0.052	0.115	-0.019	0.087
conners1	0.684	0.092	-0.012	0.063	-0.002	0.162	-0.092
conners3	0.400	0.537	-0.028	-0.073	0.051	0.099	0.158
conners5	0.270	0.635	-0.010	0.170	0.059	-0.017	0.028
conners7	0.177	0.673	-0.039	0.193	0.049	0.078	-0.065
conners9	0.190	0.262	0.059	0.541	-0.054	0.028	0.075
conners11	0.435	0.042	-0.081	0.431	-0.085	0.079	0.152
conners12	0.654	0.100	0.139	-0.012	0.018	0.033	-0.002
conners13	0.243	0.637	0.017	0.118	-0.022	0.108	-0.027
conners15	0.817	-0.008	0.012	0.088	0.019	0.038	-0.018
conners16	0.126	-0.075	-0.070	-0.719	0.061	0.075	-0.034
conners17	0.786	0.083	0.014	-0.024	0.027	0.043	-0.012
conners20	0.736	0.046	0.061	0.081	0.071	0.047	-0.184
conners24	0.230	0.737	0.013	0.020	0.066	0.011	0.042
conners27	0.693	0.279	0.073	-0.003	0.021	-0.014	0.102
conners28	0.304	0.612	-0.008	0.021	0.052	0.133	-0.084
conners30	0.749	0.174	0.069	0.026	0.051	-0.062	0.104
conners32	0.834	0.009	0.121	0.027	0.017	-0.010	0.002
conners34	0.694	0.261	0.017	-0.021	0.076	-0.040	0.137
conners35	0.683	0.031	-0.017	0.085	0.133	0.058	-0.148
conners37	-0.099	0.478	0.002	0.293	0.052	-0.032	-0.020
conners41	0.694	0.186	0.045	-0.059	0.072	-0.062	0.191

conners42	0.777	-0.022	0.186	0.007	0.006	-0.079	0.124
rcadsp1	0.057	-0.020	0.459	0.148	0.239	-0.036	0.265
rcadsp2	0.044	0.157	0.217	0.175	-0.066	-0.035	0.025
rcadsp4	-0.033	0.055	0.826	0.069	0.014	-0.019	0.006
rcadsp5	0.016	-0.086	0.050	-0.082	0.718	0.031	0.167
rcadsp6	0.097	-0.026	-0.029	0.683	0.015	0.135	0.103
rcadsp7	0.250	-0.134	0.521	0.056	0.041	-0.038	0.265
rcadsp8	0.119	-0.116	0.493	-0.173	0.172	0.170	0.114
rcadsp9	0.050	0.049	0.084	-0.103	0.558	0.063	0.291
rcadsp11	0.113	0.200	0.144	0.398	0.464	-0.145	-0.127
rcadsp12	0.112	0.039	0.850	-0.023	0.081	-0.092	-0.065
rcadsp13	0.011	0.065	0.072	0.045	0.455	0.458	-0.046
rcadsp15	0.139	0.051	0.024	0.479	0.114	-0.035	-0.048
rcadsp17	0.142	-0.033	-0.101	-0.041	0.834	-0.005	-0.007
rcadsp18	-0.066	0.122	0.283	0.313	0.209	0.146	0.141
rcadsp19	0.356	-0.598	-0.118	0.476	0.136	0.177	0.096
rcadsp20	0.137	-0.155	0.460	0.008	-0.087	0.440	0.023
rcadsp21	0.357	-0.311	0.123	0.301	0.118	0.190	-0.075
rcadsp22	0.012	0.003	0.152	0.043	0.383	0.542	-0.025
rcadsp25	0.523	0.086	0.143	0.143	-0.012	0.170	0.076
rcadsp27	-0.117	0.119	0.156	0.027	0.336	0.595	0.019
rcadsp29	-0.016	0.095	0.404	0.431	0.093	0.210	-0.093
rcadsp30	0.114	-0.062	0.801	-0.045	0.010	0.034	0.011
rcadsp32	-0.025	-0.022	0.645	0.039	-0.072	0.325	0.038
rcadsp33	0.019	0.103	0.044	0.321	0.094	0.179	0.398
rcadsp34	-0.097	0.190	-0.012	0.192	0.196	0.410	0.343
rcadsp35	-0.027	0.095	0.267	-0.009	0.215	0.403	0.242
rcadsp37	0.061	0.081	-0.004	0.125	0.337	0.417	-0.104
rcadsp38	0.318	-0.242	0.280	0.188	-0.050	0.012	0.327
rcadsp40	0.166	-0.150	-0.150	0.430	-0.013	0.289	0.228
rcadsp41	-0.149	0.148	0.029	0.125	0.156	0.478	0.327
rcadsp43	0.134	-0.087	0.477	0.027	-0.223	0.486	0.095
rcadsp45	-0.105	0.068	0.205	0.120	0.646	0.136	-0.028
rcadsp46	0.083	0.032	0.038	-0.017	0.512	0.120	0.256
rcadsp47	0.238	0.414	0.055	0.201	0.284	0.086	-0.064

Note. The Kaiser-Meyer-Olkin (KMO) = 0.45 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(2415, 453) = 72824.23$, $p = 0.000$, revealed an inadequate sampling accuracy.

Table F2

Rotated Factor Loadings for the Six-Factor Model – All Measures

	PA1	PA3	PA5	PA4	PA2	PA6
ccc2_5	0.271	0.210	0.328	0.109	0.091	0.092

ccc2_7	0.411	0.096	0.094	0.373	-0.094	-0.029
ccc2_34	0.444	0.107	0.252	0.139	0.022	0.035
ccc2_35	0.240	0.266	0.420	-0.061	0.084	-0.020
ccc2_52	0.105	0.027	0.045	0.483	0.071	0.070
ccc2_59	0.308	0.141	0.385	0.193	-0.105	0.066
sdq2	0.328	0.085	0.643	0.068	-0.073	0.118
sdq8	-0.107	0.221	0.070	0.418	0.381	0.246
sdq10	0.354	0.064	0.568	0.068	-0.034	0.151
sdq13	-0.142	0.081	0.227	0.545	0.234	0.171
sdq15	0.641	0.050	0.233	0.133	0.003	0.207
sdq16	0.186	0.221	-0.085	0.272	0.116	0.465
sdq24	-0.061	0.464	-0.045	0.282	0.152	0.355
sdq25	0.711	0.088	0.128	0.054	-0.011	0.081
conners1	0.709	0.058	0.070	0.061	0.007	-0.156
conners3	0.453	0.142	0.481	-0.024	-0.009	0.074
conners5	0.318	0.044	0.618	0.138	-0.027	0.047
conners7	0.220	0.086	0.661	0.149	-0.048	-0.067
conners9	0.209	-0.064	0.287	0.559	0.072	0.015
conners11	0.451	-0.053	0.045	0.515	-0.046	0.020
conners12	0.684	0.009	0.075	-0.024	0.147	-0.017
conners13	0.286	0.041	0.614	0.103	0.028	-0.068
conners15	0.845	0.000	-0.027	0.085	0.015	-0.044
conners16	0.125	0.141	-0.134	-0.696	-0.061	-0.032
conners17	0.821	0.024	0.051	-0.029	0.017	-0.034
conners20	0.757	0.034	0.042	0.008	0.043	-0.141
conners24	0.284	0.084	0.704	-0.006	0.002	0.053
conners27	0.739	0.003	0.241	0.008	0.077	0.079
conners28	0.349	0.125	0.583	-0.016	-0.007	-0.102
conners30	0.791	-0.005	0.143	0.029	0.062	0.106
conners32	0.865	-0.031	-0.014	0.013	0.122	0.001
conners34	0.741	0.048	0.221	-0.004	0.012	0.124
conners35	0.704	0.110	0.027	0.025	-0.037	-0.114
conners37	-0.073	0.024	0.491	0.244	-0.023	0.019
conners41	0.739	0.038	0.143	-0.026	0.043	0.172
conners42	0.808	-0.066	-0.048	0.020	0.190	0.119
rcadsp1	0.072	0.223	-0.012	0.163	0.459	0.260
rcadsp2	0.052	-0.103	0.167	0.160	0.224	0.030
rcadsp4	-0.030	-0.030	0.075	-0.002	0.839	0.057
rcadsp5	0.033	0.749	-0.086	-0.114	-0.014	0.241
rcadsp6	0.096	0.070	0.016	0.742	-0.003	-0.022
rcadsp7	0.259	0.019	-0.138	0.101	0.552	0.221
rcadsp8	0.123	0.283	-0.132	-0.153	0.530	0.049
rcadsp9	0.078	0.642	0.026	-0.075	0.054	0.286

rcadsp11	0.143	0.304	0.243	0.226	0.048	0.076
rcadsp12	0.119	-0.022	0.056	-0.140	0.829	0.061
rcadsp13	0.023	0.739	0.058	0.049	0.090	-0.170
rcadsp15	0.146	0.045	0.093	0.423	-0.004	-0.006
rcadsp17	0.158	0.787	-0.012	-0.138	-0.194	0.154
rcadsp18	-0.057	0.294	0.142	0.335	0.301	0.071
rcadsp19	0.333	0.207	-0.560	0.561	-0.093	-0.043
rcadsp20	0.122	0.175	-0.165	0.095	0.566	-0.202
rcadsp21	0.346	0.179	-0.282	0.298	0.140	-0.140
rcadsp22	0.017	0.719	-0.006	0.080	0.201	-0.211
rcadsp25	0.545	0.075	0.068	0.191	0.184	-0.041
rcadsp27	-0.110	0.722	0.101	0.093	0.223	-0.210
rcadsp29	-0.016	0.172	0.135	0.386	0.425	-0.138
rcadsp30	0.113	-0.002	-0.053	-0.094	0.831	0.030
rcadsp32	-0.034	0.118	-0.022	0.082	0.734	-0.120
rcadsp33	0.036	0.250	0.093	0.475	0.102	0.188
rcadsp34	-0.076	0.506	0.162	0.362	0.069	0.062
rcadsp35	-0.013	0.504	0.066	0.108	0.341	0.019
rcadsp37	0.070	0.582	0.081	0.121	0.013	-0.219
rcadsp38	0.320	-0.032	-0.245	0.302	0.331	0.200
rcadsp40	0.162	0.177	-0.143	0.587	-0.078	-0.024
rcadsp41	-0.131	0.511	0.115	0.308	0.127	0.013
rcadsp43	0.122	0.086	-0.108	0.163	0.608	-0.196
rcadsp45	-0.090	0.697	0.092	0.031	0.152	0.054
rcadsp46	0.108	0.621	0.014	0.022	0.018	0.217
rcadsp47	0.275	0.309	0.415	0.130	0.023	-0.023

Note. The Kaiser-Meyer-Olkin (KMO) = 0.45 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(2415, 453) = 72824.23$, $p = 0.000$, revealed an inadequate sampling accuracy.

Table F3

Rotated Factor Loadings for the Five-Factor Model – All Measures

	PA1	PA2	PA3	PA4	PA5
ccc2_5	0.301	0.233	0.087	0.098	0.311
ccc2_7	0.408	0.085	-0.085	0.377	0.085
ccc2_34	0.464	0.112	0.022	0.135	0.235
ccc2_35	0.240	0.251	0.089	-0.057	0.409
ccc2_52	0.128	0.050	0.072	0.470	0.040
ccc2_59	0.336	0.157	-0.108	0.184	0.368
sdq2	0.384	0.118	-0.084	0.049	0.615
sdq8	-0.041	0.303	0.366	0.375	0.056
sdq10	0.418	0.107	-0.049	0.046	0.538
sdq13	-0.083	0.140	0.227	0.507	0.215

sdq15	0.711	0.112	-0.017	0.108	0.199
sdq16	0.289	0.363	0.088	0.212	-0.100
sdq24	0.010	0.573	0.135	0.238	-0.058
sdq25	0.744	0.109	-0.020	0.047	0.101
conners1	0.671	0.000	0.023	0.086	0.065
conners3	0.489	0.157	-0.015	-0.032	0.458
conners5	0.357	0.051	-0.030	0.127	0.598
conners7	0.227	0.056	-0.039	0.153	0.649
conners9	0.235	-0.061	0.077	0.549	0.277
conners11	0.472	-0.046	-0.045	0.510	0.031
conners12	0.693	-0.006	0.146	-0.019	0.058
conners13	0.295	0.010	0.036	0.107	0.601
conners15	0.844	-0.021	0.018	0.096	-0.046
conners16	0.099	0.126	-0.066	-0.678	-0.134
conners17	0.822	0.004	0.018	-0.018	0.032
conners20	0.723	-0.020	0.056	0.033	0.035
conners24	0.325	0.093	-0.004	-0.017	0.682
conners27	0.781	0.020	0.066	0.000	0.212
conners28	0.342	0.081	0.003	-0.003	0.570
conners30	0.838	0.023	0.049	0.018	0.112
conners32	0.880	-0.039	0.118	0.017	-0.037
conners34	0.791	0.081	-0.003	-0.017	0.188
conners35	0.674	0.067	-0.026	0.048	0.019
conners37	-0.051	0.028	-0.020	0.234	0.484
conners41	0.799	0.088	0.023	-0.043	0.109
conners42	0.856	-0.034	0.175	0.007	-0.077
rcadsp1	0.136	0.306	0.437	0.129	-0.029
rcadsp2	0.077	-0.096	0.223	0.149	0.162
rcadsp4	-0.001	-0.019	0.836	-0.019	0.073
rcadsp5	0.053	0.828	-0.028	-0.130	-0.100
rcadsp6	0.092	0.066	0.010	0.739	0.018
rcadsp7	0.319	0.090	0.529	0.071	-0.153
rcadsp8	0.122	0.294	0.530	-0.157	-0.135
rcadsp9	0.119	0.728	0.037	-0.097	0.009
rcadsp11	0.160	0.327	0.047	0.216	0.232
rcadsp12	0.150	-0.010	0.823	-0.155	0.049
rcadsp13	-0.058	0.665	0.125	0.087	0.073
rcadsp15	0.150	0.044	0.003	0.421	0.090
rcadsp17	0.155	0.843	-0.204	-0.144	-0.027
rcadsp18	-0.045	0.317	0.305	0.322	0.139
rcadsp19	0.294	0.200	-0.078	0.571	-0.552
rcadsp20	0.059	0.106	0.586	0.122	-0.146
rcadsp21	0.293	0.133	0.161	0.319	-0.270

rcadsp22	-0.074	0.630	0.238	0.122	0.014
rcadsp25	0.543	0.056	0.191	0.197	0.057
rcadsp27	-0.194	0.635	0.260	0.131	0.118
rcadsp29	-0.049	0.124	0.448	0.396	0.145
rcadsp30	0.130	0.000	0.831	-0.104	-0.055
rcadsp32	-0.065	0.073	0.750	0.093	-0.009
rcadsp33	0.081	0.313	0.095	0.446	0.082
rcadsp34	-0.081	0.527	0.077	0.356	0.162
rcadsp35	-0.030	0.506	0.351	0.109	0.068
rcadsp37	-0.014	0.494	0.052	0.160	0.097
rcadsp38	0.371	0.035	0.315	0.273	-0.256
rcadsp40	0.144	0.173	-0.065	0.590	-0.140
rcadsp41	-0.151	0.515	0.140	0.308	0.121
rcadsp43	0.069	0.019	0.628	0.185	-0.091
rcadsp45	-0.111	0.716	0.157	0.031	0.092
rcadsp46	0.132	0.690	0.008	0.005	0.001
rcadsp47	0.272	0.295	0.031	0.134	0.404

Note. The Kaiser-Meyer-Olkin (KMO) = 0.45 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(2415, 453) = 72824.23$, $p = 0.000$, revealed an inadequate sampling accuracy.

Appendix G

Items Deleted Due to High Correlation

Table G1

Items Removed From Analysis Due to High Multicollinearity

Measure	Item No.	Item
SDQ	2	Restless, Overactive, Cannot Stay Still for long
SDQ	10	Constantly fidgeting or squirming
SDQ	15	Easily distracted, concentration wanders
Conners	3	Fidgets or squirms in seat
Conners	24	Is constantly moving
Conners	27	Has a short attention span
Conners	30	Has trouble concentrating
Conners	41	Has trouble keeping his/her mind on work or on play for long
RCADSP	22	My child worries that bad things with happen to him/her

Appendix H

Rotated Factor Loadings for Exploratory Factor Analysis Models – Items Removed (IM)

Table H1

Rotated Factor Loadings for the Eight-Factor Model – Items Removed

	PA1	PA7	PA8	PA3	PA5	PA2	PA4	PA6
ccc2_5	0.191	0.053	0.554	0.187	0.009	-0.083	0.041	0.165
ccc2_7	0.320	-0.041	0.322	-0.108	0.085	0.071	0.289	0.093
ccc2_34	0.365	-0.052	0.477	0.055	-0.032	-0.001	0.095	0.153
ccc2_35	0.165	0.107	0.646	0.183	-0.084	-0.034	-0.022	-0.015
ccc2_52	0.090	-0.073	0.123	-0.031	0.258	0.117	0.217	0.202
ccc2_59	0.331	0.019	0.428	-0.148	0.168	0.050	-0.089	0.201
sdq8	-0.134	0.127	0.091	0.330	0.300	0.068	0.133	0.342
sdq13	-0.068	0.071	-0.011	0.171	0.649	0.010	0.008	0.228
sdq16	0.181	0.140	-0.056	-0.008	0.108	0.060	-0.009	0.702
sdq24	-0.096	0.328	0.040	0.067	0.147	0.110	0.068	0.505
sdq25	0.673	0.081	0.117	0.023	0.088	-0.025	0.011	0.119
conners1	0.695	0.026	0.101	-0.058	0.021	0.154	0.069	-0.058
conners5	0.453	0.092	0.374	0.007	0.275	-0.100	-0.112	-0.004
conners7	0.342	0.079	0.499	0.002	0.272	-0.071	-0.130	-0.090
conners9	0.257	-0.053	0.161	0.007	0.493	0.019	0.146	0.084
conners11	0.360	-0.104	0.206	-0.060	0.225	-0.007	0.354	0.113
conners12	0.643	0.001	0.118	0.169	-0.026	-0.016	0.037	0.055
conners13	0.344	-0.002	0.551	0.064	0.178	-0.046	-0.066	-0.079
conners15	0.737	-0.015	0.105	0.052	-0.022	-0.005	0.178	0.022
conners16	0.034	0.086	0.142	0.051	-0.736	-0.061	-0.116	-0.059
conners17	0.799	0.020	0.029	-0.012	0.000	0.061	-0.008	0.075
conners20	0.803	0.096	-0.079	-0.022	0.075	0.122	0.003	-0.087
conners28	0.476	0.129	0.390	-0.054	0.169	0.062	-0.204	-0.086
conners32	0.785	-0.007	0.055	0.153	-0.047	-0.016	0.132	0.040
conners34	0.719	0.060	0.202	0.043	0.034	-0.057	-0.023	0.150
conners35	0.746	0.172	-0.103	-0.107	0.093	0.134	0.018	-0.069
conners37	0.108	0.070	0.201	-0.059	0.406	-0.007	-0.182	-0.004
conners42	0.728	-0.023	-0.025	0.194	-0.004	-0.033	0.067	0.201
rcadsp1	0.020	0.184	0.016	0.467	0.151	-0.019	0.083	0.278
rcadsp2	-0.001	0.017	0.095	0.070	0.336	-0.001	0.151	0.088
rcadsp4	-0.081	-0.031	0.074	0.822	0.076	0.067	0.004	-0.002
rcadsp5	-0.018	0.718	-0.010	0.074	-0.098	-0.062	0.091	0.166
rcadsp6	0.036	-0.019	0.106	-0.010	0.466	0.033	0.451	0.047
rcadsp7	0.205	0.005	-0.082	0.456	0.032	0.117	0.044	0.298

rcadsp8	0.016	0.173	0.076	0.488	-0.204	0.158	0.072	0.090
rcadsp9	0.077	0.557	0.066	0.064	-0.042	0.027	-0.048	0.308
rcadsp11	0.194	0.409	0.047	0.208	0.366	-0.204	0.100	-0.091
rcadsp12	0.091	0.034	-0.001	0.845	0.008	0.034	-0.046	-0.044
rcadsp13	-0.041	0.518	0.208	0.050	0.036	0.269	0.116	-0.074
rcadsp15	0.116	0.057	0.094	0.088	0.293	-0.132	0.318	-0.055
rcadsp17	0.170	0.835	-0.059	-0.046	-0.051	-0.114	0.056	0.017
rcadsp18	-0.068	0.182	0.190	0.288	0.212	0.093	0.192	0.074
rcadsp19	0.040	0.052	-0.112	0.012	-0.010	-0.036	0.924	-0.015
rcadsp20	0.146	0.031	-0.124	0.135	-0.017	0.722	0.032	0.014
rcadsp21	0.158	0.077	-0.025	0.199	0.017	0.068	0.541	-0.140
rcadsp25	0.479	-0.014	0.194	0.136	0.036	0.135	0.186	0.049
rcadsp27	-0.168	0.415	0.282	0.120	0.045	0.361	0.118	-0.024
rcadsp29	0.057	0.144	-0.042	0.223	0.441	0.332	0.085	-0.081
rcadsp30	0.052	0.003	-0.027	0.762	-0.052	0.149	0.057	-0.014
rcadsp32	-0.025	0.012	-0.019	0.408	0.084	0.545	-0.041	0.017
rcadsp33	0.015	0.111	0.235	-0.015	0.189	0.136	0.224	0.331
rcadsp34	-0.158	0.260	0.451	-0.029	0.072	0.226	0.278	0.168
rcadsp35	-0.041	0.301	0.216	0.151	-0.009	0.377	0.053	0.177
rcadsp37	0.055	0.399	0.125	-0.079	0.151	0.296	0.084	-0.091
rcadsp38	0.289	-0.103	-0.174	0.159	0.061	0.177	0.195	0.382
rcadsp40	0.038	0.000	0.134	-0.152	0.142	0.151	0.550	0.114
rcadsp41	-0.182	0.247	0.373	-0.047	0.039	0.350	0.163	0.199
rcadsp43	0.135	-0.113	-0.034	0.130	0.015	0.792	0.018	0.076
rcadsp45	-0.023	0.697	-0.048	0.142	0.172	0.119	-0.009	-0.012
rcadsp46	0.133	0.512	0.063	-0.005	-0.006	0.077	-0.012	0.297
rcadsp47	0.392	0.313	0.217	0.024	0.244	0.032	-0.030	-0.070

Note. The Kaiser-Meyer-Olkin (KMO) = 0.84 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(1830, 453) = 28716.61$, $p = 0.000$, revealed adequate sampling accuracy.

Table H2

Rotated Factor Loadings for the Seven-Factor Model – Items Removed

	PA1	PA7	PA4	PA2	PA3	PA6	PA5
ccc2_5	0.381	0.099	0.058	0.051	0.083	0.268	0.317
ccc2_7	0.470	-0.006	0.206	-0.176	0.209	0.164	0.013
ccc2_34	0.548	-0.018	0.020	-0.045	0.140	0.240	0.214
ccc2_35	0.367	0.144	-0.054	0.033	0.158	0.113	0.406
ccc2_52	0.152	-0.052	0.349	-0.015	0.150	0.223	-0.041
ccc2_59	0.432	0.014	0.125	-0.160	0.119	0.238	0.341
sdq8	-0.093	0.160	0.363	0.346	0.065	0.364	0.015
sdq13	-0.101	0.071	0.646	0.241	-0.064	0.182	0.111
sdq16	0.168	0.159	0.077	0.091	-0.031	0.607	-0.070

sdq24	-0.093	0.355	0.155	0.125	0.091	0.487	-0.027
sdq25	0.738	0.083	0.063	0.019	-0.043	0.091	0.071
conners1	0.760	0.015	0.012	-0.029	0.144	-0.081	0.008
conners5	0.541	0.087	0.234	-0.043	-0.049	0.012	0.379
conners7	0.454	0.072	0.233	-0.071	0.032	-0.038	0.479
conners9	0.312	-0.044	0.561	0.016	0.032	0.083	0.098
conners11	0.493	-0.065	0.376	-0.126	0.095	0.163	-0.076
conners12	0.732	0.009	-0.029	0.141	-0.023	0.046	0.035
conners13	0.497	0.004	0.173	-0.033	0.086	0.002	0.442
conners15	0.848	0.003	0.026	0.009	0.020	0.023	-0.070
conners16	0.096	0.098	-0.755	-0.050	0.023	-0.004	0.022
conners17	0.845	0.007	-0.047	0.023	0.003	0.023	0.002
conners20	0.802	0.070	0.027	0.049	0.029	-0.164	-0.044
conners28	0.547	0.102	0.074	-0.056	0.097	-0.077	0.424
conners32	0.883	0.009	-0.020	0.121	-0.027	0.024	-0.075
conners34	0.812	0.064	-0.001	0.016	-0.056	0.140	0.136
conners35	0.728	0.144	0.045	-0.025	0.043	-0.151	-0.066
conners37	0.103	0.043	0.327	-0.028	-0.021	-0.018	0.336
conners42	0.791	-0.012	-0.007	0.199	-0.100	0.158	-0.086
rcadsp1	0.057	0.221	0.190	0.459	-0.051	0.281	-0.020
rcadsp2	0.036	0.035	0.411	0.060	0.029	0.102	0.028
rcadsp4	-0.016	-0.001	0.106	0.790	0.034	0.036	0.071
rcadsp5	-0.020	0.766	-0.085	0.035	-0.022	0.156	-0.075
rcadsp6	0.120	0.027	0.672	-0.050	0.126	0.089	-0.139
rcadsp7	0.228	0.022	0.036	0.512	0.017	0.270	-0.103
rcadsp8	0.084	0.204	-0.175	0.472	0.167	0.129	-0.046
rcadsp9	0.076	0.580	-0.089	0.082	0.018	0.283	0.052
rcadsp11	0.211	0.439	0.416	0.143	-0.181	-0.110	0.082
rcadsp12	0.136	0.055	0.006	0.821	-0.035	-0.033	0.049
rcadsp13	0.004	0.539	0.069	0.060	0.354	-0.044	0.070
rcadsp15	0.195	0.100	0.446	-0.002	-0.042	-0.017	-0.070
rcadsp17	0.140	0.870	-0.064	-0.084	-0.089	-0.027	-0.057
rcadsp18	0.012	0.222	0.309	0.257	0.157	0.123	0.039
rcadsp19	0.170	0.149	0.378	-0.118	0.160	0.085	-0.628
rcadsp20	0.101	0.004	-0.047	0.374	0.553	-0.039	-0.155
rcadsp21	0.260	0.135	0.246	0.118	0.173	-0.076	-0.347
rcadsp25	0.596	0.007	0.103	0.117	0.177	0.077	-0.011
rcadsp27	-0.104	0.436	0.088	0.142	0.456	0.031	0.108
rcadsp29	0.028	0.132	0.459	0.344	0.250	-0.123	0.002
rcadsp30	0.103	0.029	-0.017	0.761	0.091	0.003	-0.061
rcadsp32	-0.041	-0.007	0.048	0.579	0.419	-0.007	-0.001
rcadsp33	0.105	0.148	0.283	-0.018	0.211	0.376	0.005
rcadsp34	-0.010	0.312	0.202	-0.082	0.412	0.279	0.097

rcadsp35	0.012	0.316	-0.005	0.216	0.404	0.206	0.071
rcadsp37	0.063	0.400	0.161	-0.019	0.330	-0.099	0.055
rcadsp38	0.300	-0.084	0.117	0.249	0.073	0.333	-0.278
rcadsp40	0.158	0.059	0.375	-0.200	0.299	0.185	-0.273
rcadsp41	-0.081	0.277	0.103	-0.032	0.477	0.279	0.104
rcadsp43	0.116	-0.136	-0.013	0.383	0.620	0.035	-0.102
rcadsp45	-0.078	0.705	0.140	0.195	0.085	-0.059	0.030
rcadsp46	0.134	0.530	-0.042	0.029	0.068	0.267	0.029
rcadsp47	0.435	0.312	0.219	0.021	0.054	-0.083	0.222

Note. The Kaiser-Meyer-Olkin (KMO) = 0.84 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(1830, 453) = 28716.61$, $p = 0.000$, revealed adequate sampling accuracy.

Table H3

Rotated Factor Loadings for the Six-Factor Model – Items Removed

	PA1	PA2	PA4	PA3	PA5	PA6
ccc2_5	0.428	0.242	0.155	0.083	0.241	-0.036
ccc2_7	0.496	0.085	0.282	-0.118	-0.049	0.132
ccc2_34	0.584	0.115	0.126	0.009	0.128	0.018
ccc2_35	0.414	0.243	-0.013	0.071	0.344	0.071
ccc2_52	0.171	0.047	0.443	0.038	-0.084	0.061
ccc2_59	0.485	0.151	0.226	-0.122	0.255	0.027
sdq8	-0.075	0.314	0.480	0.384	-0.016	-0.092
sdq13	-0.063	0.104	0.676	0.225	0.127	-0.078
sdq16	0.182	0.418	0.300	0.123	-0.159	-0.240
sdq24	-0.079	0.593	0.322	0.162	-0.093	-0.109
sdq25	0.772	0.095	0.070	0.006	0.040	-0.057
conners1	0.783	-0.023	-0.031	-0.001	-0.015	0.153
conners5	0.602	0.075	0.209	-0.072	0.365	-0.007
conners7	0.520	0.060	0.199	-0.083	0.464	0.075
conners9	0.354	-0.046	0.575	0.021	0.095	0.046
conners11	0.520	-0.015	0.440	-0.097	-0.116	0.054
conners12	0.755	0.002	-0.035	0.144	0.010	-0.048
conners13	0.558	0.017	0.166	-0.019	0.409	0.088
conners15	0.869	-0.016	0.014	0.015	-0.098	0.011
conners16	0.065	0.150	-0.725	-0.034	-0.017	-0.047
conners17	0.869	-0.007	-0.059	0.026	-0.031	-0.007
conners20	0.817	-0.033	-0.070	0.038	-0.031	0.094
conners28	0.603	0.088	0.027	-0.052	0.402	0.126
conners32	0.901	-0.021	-0.039	0.120	-0.096	-0.038
conners34	0.850	0.102	0.030	0.007	0.089	-0.094

conners35	0.741	0.053	-0.047	-0.039	-0.052	0.110
conners37	0.150	0.026	0.300	-0.050	0.342	0.029
conners42	0.807	0.006	0.026	0.194	-0.118	-0.156
rcadsp1	0.068	0.318	0.253	0.464	-0.030	-0.172
rcadsp2	0.059	0.060	0.433	0.064	0.029	0.017
rcadsp4	-0.012	-0.011	0.084	0.829	0.097	-0.054
rcadsp5	-0.020	0.854	-0.095	-0.014	-0.069	-0.066
rcadsp6	0.142	0.036	0.689	-0.029	-0.132	0.131
rcadsp7	0.226	0.117	0.120	0.557	-0.132	-0.139
rcadsp8	0.074	0.288	-0.146	0.534	-0.067	0.018
rcadsp9	0.089	0.739	-0.030	0.067	0.016	-0.097
rcadsp11	0.250	0.324	0.274	0.047	0.146	-0.038
rcadsp12	0.137	0.003	-0.056	0.830	0.087	-0.087
rcadsp13	0.016	0.593	0.014	0.106	0.067	0.308
rcadsp15	0.216	0.048	0.399	-0.033	-0.039	0.024
rcadsp17	0.144	0.833	-0.151	-0.165	-0.010	-0.020
rcadsp18	0.029	0.282	0.329	0.294	0.037	0.082
rcadsp19	0.137	0.157	0.394	-0.087	-0.611	0.139
rcadsp20	0.081	0.056	-0.042	0.533	-0.183	0.400
rcadsp21	0.243	0.083	0.190	0.149	-0.315	0.177
rcadsp25	0.616	0.042	0.125	0.171	-0.048	0.105
rcadsp27	-0.092	0.541	0.082	0.232	0.085	0.346
rcadsp29	0.046	0.078	0.372	0.389	0.040	0.254
rcadsp30	0.093	0.012	-0.048	0.813	-0.039	-0.005
rcadsp32	-0.048	0.036	0.049	0.712	-0.011	0.272
rcadsp33	0.129	0.343	0.430	0.050	-0.066	0.046
rcadsp34	0.015	0.514	0.318	0.019	0.022	0.233
rcadsp35	0.022	0.485	0.072	0.322	0.013	0.213
rcadsp37	0.079	0.412	0.093	0.021	0.060	0.327
rcadsp38	0.290	0.041	0.248	0.311	-0.328	-0.089
rcadsp40	0.158	0.159	0.461	-0.126	-0.315	0.210
rcadsp41	-0.061	0.495	0.232	0.093	0.020	0.262
rcadsp43	0.101	-0.037	0.045	0.573	-0.155	0.410
rcadsp45	-0.063	0.683	0.042	0.163	0.076	0.106
rcadsp46	0.148	0.683	0.018	0.027	-0.012	-0.043
rcadsp47	0.478	0.272	0.136	-0.003	0.233	0.108

Note. The Kaiser-Meyer-Olkin (KMO) = 0.84 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(1830, 453) = 28716.61$, $p = 0.000$, revealed adequate sampling accuracy.

Table H4

Rotated Factor Loadings for the Five-Factor Model – Items Removed

	PA1	PA3	PA2	PA4	PA5
ccc2_5	0.423	0.243	0.077	0.070	0.263
ccc2_7	0.466	0.093	-0.086	0.344	0.033
ccc2_34	0.569	0.117	0.013	0.102	0.163
ccc2_35	0.387	0.250	0.080	-0.076	0.360
ccc2_52	0.163	0.049	0.065	0.462	-0.001
ccc2_59	0.466	0.160	-0.120	0.173	0.306
sdq8	-0.044	0.305	0.387	0.384	0.027
sdq13	-0.034	0.109	0.227	0.541	0.197
sdq16	0.226	0.396	0.094	0.226	-0.146
sdq24	-0.050	0.581	0.157	0.268	-0.068
sdq25	0.771	0.095	-0.007	0.047	0.055
conners1	0.740	-0.017	0.028	0.048	0.029
conners5	0.586	0.083	-0.079	0.115	0.407
conners7	0.487	0.073	-0.076	0.109	0.518
conners9	0.343	-0.040	0.042	0.538	0.196
conners11	0.507	-0.012	-0.075	0.482	-0.026
conners12	0.755	-0.004	0.134	-0.049	0.009
conners13	0.524	0.028	-0.006	0.093	0.461
conners15	0.858	-0.018	0.017	0.060	-0.076
conners16	0.064	0.142	-0.062	-0.687	-0.130
conners17	0.859	-0.009	0.021	-0.035	-0.023
conners20	0.787	-0.030	0.054	-0.009	-0.006
conners28	0.561	0.101	-0.036	-0.019	0.440
conners32	0.900	-0.028	0.114	-0.016	-0.093
conners34	0.851	0.100	-0.016	-0.014	0.093
conners35	0.709	0.059	-0.020	0.027	-0.022
conners37	0.136	0.037	-0.045	0.208	0.393
conners42	0.827	-0.006	0.167	0.001	-0.128
rcadsp1	0.108	0.302	0.443	0.149	-0.032
rcadsp2	0.060	0.061	0.081	0.401	0.096
rcadsp4	0.009	-0.025	0.833	-0.027	0.080
rcadsp5	-0.008	0.856	-0.031	-0.101	-0.101
rcadsp6	0.124	0.043	0.018	0.735	0.001
rcadsp7	0.257	0.099	0.544	0.061	-0.142
rcadsp8	0.077	0.278	0.550	-0.154	-0.095
rcadsp9	0.103	0.735	0.048	-0.074	-0.008
rcadsp11	0.253	0.328	0.043	0.203	0.179
rcadsp12	0.160	-0.014	0.824	-0.164	0.047
rcadsp13	-0.035	0.599	0.172	0.099	0.119
rcadsp15	0.212	0.051	-0.018	0.401	0.031
rcadsp17	0.142	0.844	-0.181	-0.140	-0.037
rcadsp18	0.018	0.283	0.326	0.307	0.096

rcadsp19	0.126	0.156	-0.035	0.589	-0.513
rcadsp20	0.020	0.070	0.613	0.118	-0.118
rcadsp21	0.219	0.083	0.201	0.319	-0.246
rcadsp25	0.592	0.042	0.200	0.168	0.001
rcadsp27	-0.145	0.548	0.310	0.160	0.148
rcadsp29	0.009	0.086	0.458	0.402	0.134
rcadsp30	0.105	-0.006	0.833	-0.097	-0.061
rcadsp32	-0.084	0.038	0.781	0.095	0.031
rcadsp33	0.122	0.345	0.075	0.435	0.010
rcadsp34	-0.026	0.526	0.077	0.374	0.113
rcadsp35	-0.013	0.489	0.376	0.117	0.057
rcadsp37	0.023	0.424	0.092	0.188	0.130
rcadsp38	0.313	0.027	0.313	0.269	-0.299
rcadsp40	0.126	0.167	-0.064	0.602	-0.194
rcadsp41	-0.104	0.506	0.157	0.296	0.100
rcadsp43	0.039	-0.019	0.656	0.190	-0.077
rcadsp45	-0.081	0.692	0.187	0.039	0.091
rcadsp46	0.152	0.683	0.019	0.001	-0.017
rcadsp47	0.447	0.283	0.016	0.114	0.280

Note. The Kaiser-Meyer-Olkin (KMO) = 0.84 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(1830, 453) = 28716.61$, $p = 0.000$, revealed adequate sampling accuracy.

Appendix I

Remaining Measure Items

Table I1

Remaining Measure Items Following Removal of the SDQ (Goodman, 1997) and CCC-2 (Bishop, 2003) and the Items that Highly Correlated

Item ID	Item
conners1	Forgets to turn in completed work
conners5	Restless or overactive
conners7	Runs or climbs when he/she is not supposed to
conners9	Is difficult to please or amuse
conners11	Is hard to motivate (even with rewards like candy or money)
conners12	Makes mistakes
conners13	Acts as if driven by a motor
conners15	Has trouble getting started on tasks or projects
conners16	Is happy, cheerful, and has a positive attitude (negative)
conners17	Doesn't pay attention to details; makes careless mistakes
conners20	Loses things (for example, schoolwork, pencils, books, tools, or toys).
conners28	Excitable, impulsive.
conners32	Has trouble organizing tasks or activities.
conners34	Inattentive, easily distracted.
conners35	Is messy or disorganized.
conners37	Is patient and content, even when waiting in a long line (negative)
conners42	Has to struggle to complete hard tasks.
rcadsp1	My child worries about things.
rcadsp2	My child feels sad or empty
rcadsp4	My child worries when he/she thinks he/she has done poorly at something.

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- rcadsp5 My child feels afraid of
being alone at home.
- rcadsp6 Nothing is much fun for
my child anymore.
- rcadsp7 My child feels scared when
taking a test.
- rcadsp8 My child worries when
he/she thinks someone is
angry with him/her.
- rcadsp9 My child worries about
being away from me.
- rcadsp11 My child has trouble
sleeping.
- rcadsp12 My child worries about
doing badly at school
work.
- rcadsp13 My child worries
something awful will
happen to someone in the
family.
- rcadsp15 My child has problems
with his/her appetite.
- rcadsp17 My child feels scared to
sleep on his/her own.
- rcadsp18 My child has trouble going
to school in the mornings
because of feeling nervous
or afraid
- rcadsp19 My child has no energy for
things.
- rcadsp20 My child worries about
looking foolish.
- rcadsp21 My child is tired a lot.
- rcadsp25 My child cannot think
clearly.
- rcadsp27 My child worries that
something bad will happen
to him/her.
- rcadsp29 My child feels worthless.
- rcadsp30 My child worries about
making mistakes.
- rcadsp32 My child worries what
other people think of
him/her.
- rcadsp33 My child is afraid of being
in crowded places (like
shopping centres, the
movies, buses, busy
playgrounds).
- rcadsp34 All of a sudden my child
will feel really scared for
no reason at all.

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rcadsp35	My child worries about what is going to happen.
rcadsp37	My child thinks about death
rcadsp38	My child is afraid if he/she has to talk in front of the class.
rcadsp40	My child feels like he/she doesn't want to move.
rcadsp41	My child worries that he/she will suddenly get a scared feeling when there is nothing to be afraid of.
rcadsp43	My child feels afraid that he/she will make a fool of him/herself in front of people.
rcadsp45	My child worries when in bed at night.
rcadsp46	My child would feel scared if he/she had to stay away from home overnight.
rcadsp47	My child feels restless.

Appendix J

Rotated Factor Loadings for Exploratory Factor Analysis Models - Measures Removed
(MR)

Table J1

Rotated Factor Loadings for the Seven-Factor Model – Measures Removed

	PA1	PA3	PA2	PA4	PA6	PA7	PA5
conners1	0.761	-0.011	-0.046	0.034	0.115	-0.015	0.046
conners5	0.472	0.067	0.019	0.270	-0.121	0.169	0.398
conners7	0.400	0.073	-0.017	0.276	-0.067	0.137	0.464
conners9	0.231	-0.059	0.096	0.525	-0.027	0.254	0.077
conners11	0.452	-0.049	-0.069	0.301	-0.021	0.330	-0.128
conners12	0.749	0.005	0.111	-0.050	-0.005	0.050	0.048
conners13	0.425	0.005	0.036	0.220	-0.049	0.197	0.431
conners15	0.828	0.016	0.001	0.034	-0.018	0.052	-0.094
conners16	0.087	0.105	-0.056	-0.665	-0.076	-0.018	0.077
conners17	0.880	0.007	-0.035	-0.053	0.049	-0.008	0.023
conners20	0.828	0.014	-0.013	0.071	0.093	-0.174	-0.002
conners28	0.526	0.076	-0.076	0.116	0.059	0.112	0.462
conners32	0.874	0.012	0.120	-0.013	-0.030	-0.016	-0.078
conners34	0.774	0.100	0.042	-0.008	-0.099	0.165	0.130
conners35	0.770	0.087	-0.107	0.058	0.122	-0.131	-0.022
conners37	0.084	0.051	-0.020	0.361	0.006	0.013	0.294
conners42	0.792	0.006	0.195	-0.046	-0.056	0.061	-0.092
rcadsp1	0.028	0.289	0.507	0.171	-0.006	0.106	-0.080
rcadsp2	0.036	0.045	0.093	0.375	0.036	0.112	-0.015
rcadsp4	-0.082	0.002	0.834	0.106	0.056	-0.011	0.051
rcadsp5	-0.035	0.803	0.088	-0.088	-0.085	0.095	-0.096
rcadsp6	0.052	0.010	0.033	0.613	0.035	0.276	-0.193
rcadsp7	0.213	0.065	0.545	-0.025	0.049	0.131	-0.109
rcadsp8	0.108	0.252	0.446	-0.207	0.164	0.037	-0.084
rcadsp9	0.071	0.653	0.134	-0.090	-0.038	0.178	0.018
rcadsp11	0.164	0.382	0.200	0.462	-0.156	-0.118	0.059
rcadsp12	0.063	0.032	0.899	0.005	-0.036	-0.075	0.057
rcadsp13	0.059	0.568	-0.027	0.145	0.367	-0.060	0.021
rcadsp15	0.142	0.073	0.078	0.461	-0.105	0.037	-0.119
rcadsp17	0.129	0.821	-0.043	-0.043	-0.126	-0.012	-0.028
rcadsp18	-0.067	0.225	0.362	0.254	0.037	0.289	0.023
rcadsp19	0.159	0.127	-0.037	0.333	0.022	0.133	-0.725
rcadsp20	0.135	-0.019	0.253	-0.054	0.604	0.052	-0.118
rcadsp21	0.245	0.086	0.138	0.205	0.101	0.044	-0.363

rcadsp25	0.581	0.003	0.122	0.073	0.110	0.194	-0.021
rcadsp27	-0.062	0.467	0.082	0.136	0.436	0.073	0.069
rcadsp29	0.044	0.078	0.293	0.450	0.336	-0.041	-0.007
rcadsp30	0.070	0.017	0.774	-0.055	0.113	-0.014	-0.052
rcadsp32	-0.031	-0.016	0.493	0.027	0.474	0.065	0.005
rcadsp33	0.059	0.206	0.082	0.207	0.067	0.490	-0.037
rcadsp34	-0.029	0.358	-0.001	0.131	0.207	0.527	0.055
rcadsp35	0.034	0.378	0.171	-0.020	0.376	0.230	0.049
rcadsp37	0.126	0.401	-0.111	0.280	0.405	-0.177	0.027
rcadsp38	0.268	-0.060	0.300	0.039	0.056	0.286	-0.266
rcadsp40	0.141	0.055	-0.121	0.266	0.116	0.433	-0.296
rcadsp41	-0.035	0.335	-0.018	0.002	0.348	0.473	0.072
rcadsp43	0.141	-0.150	0.262	-0.039	0.663	0.170	-0.072
rcadsp45	-0.055	0.679	0.162	0.143	0.138	-0.058	0.040
rcadsp46	0.147	0.587	0.069	-0.032	0.022	0.155	-0.001
rcadsp47	0.408	0.277	0.023	0.250	0.034	0.048	0.245

Note. The Kaiser-Meyer-Olkin (KMO) = 0.84 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(1225, 453) = 22195.13$, $p = 0.000$, revealed adequate sampling accuracy.

Table J2

Rotated Factor Loadings for the Six-Factor Model – Measures Removed

	PA1	PA3	PA4	PA2	PA6	PA5
conners1	0.747	-0.011	0.005	-0.054	0.118	0.072
conners5	0.471	0.089	0.135	0.031	-0.112	0.503
conners7	0.398	0.097	0.086	-0.005	-0.067	0.565
conners9	0.207	-0.044	0.561	0.106	-0.011	0.320
conners11	0.435	-0.022	0.518	-0.066	0.012	0.049
conners12	0.747	0.010	-0.025	0.108	0.010	0.039
conners13	0.432	0.037	0.089	0.042	-0.032	0.512
conners15	0.813	0.013	0.122	0.001	-0.010	-0.053
conners16	0.125	0.118	-0.603	-0.065	-0.053	-0.203
conners17	0.871	0.006	-0.047	-0.039	0.054	0.014
conners20	0.792	-0.012	-0.020	-0.011	0.069	0.032
conners28	0.531	0.109	-0.070	-0.077	0.068	0.497
conners32	0.860	-0.001	0.038	0.120	-0.026	-0.066
conners34	0.776	0.122	0.035	0.042	-0.073	0.144
conners35	0.737	0.071	-0.005	-0.110	0.101	0.013
conners37	0.070	0.055	0.164	-0.011	-0.011	0.425
conners42	0.786	0.004	0.059	0.192	-0.035	-0.090
rcadsp1	0.018	0.305	0.230	0.500	0.003	-0.002

rcadsp2	0.010	0.050	0.391	0.103	0.026	0.156
rcadsp4	-0.081	0.000	0.045	0.827	0.072	0.071
rcadsp5	-0.036	0.841	-0.005	0.077	-0.099	-0.119
rcadsp6	0.009	0.022	0.780	0.040	0.043	0.111
rcadsp7	0.218	0.084	0.098	0.526	0.087	-0.108
rcadsp8	0.118	0.279	-0.139	0.417	0.189	-0.169
rcadsp9	0.080	0.701	-0.014	0.116	-0.025	-0.005
rcadsp11	0.132	0.349	0.289	0.212	-0.191	0.235
rcadsp12	0.069	0.020	-0.074	0.895	-0.024	0.028
rcadsp13	0.027	0.590	0.045	-0.040	0.320	0.084
rcadsp15	0.107	0.052	0.480	0.094	-0.123	0.092
rcadsp17	0.120	0.841	-0.056	-0.047	-0.157	-0.040
rcadsp18	-0.068	0.268	0.347	0.348	0.072	0.147
rcadsp19	0.103	0.109	0.724	-0.033	0.019	-0.500
rcadsp20	0.129	0.019	0.003	0.191	0.651	-0.127
rcadsp21	0.209	0.077	0.380	0.133	0.099	-0.237
rcadsp25	0.575	0.030	0.183	0.106	0.147	0.037
rcadsp27	-0.083	0.517	0.080	0.055	0.422	0.131
rcadsp29	0.008	0.084	0.339	0.276	0.311	0.172
rcadsp30	0.075	0.021	-0.043	0.757	0.137	-0.089
rcadsp32	-0.030	0.020	0.019	0.443	0.518	0.012
rcadsp33	0.068	0.278	0.444	0.062	0.129	0.097
rcadsp34	-0.013	0.450	0.343	-0.021	0.257	0.152
rcadsp35	0.038	0.448	0.045	0.128	0.412	0.057
rcadsp37	0.077	0.396	0.104	-0.103	0.323	0.136
rcadsp38	0.268	-0.030	0.323	0.276	0.118	-0.202
rcadsp40	0.123	0.105	0.609	-0.129	0.158	-0.111
rcadsp41	-0.019	0.433	0.193	-0.045	0.390	0.109
rcadsp43	0.143	-0.096	0.058	0.193	0.737	-0.068
rcadsp45	-0.074	0.695	0.032	0.146	0.107	0.091
rcadsp46	0.147	0.632	0.034	0.051	0.029	0.003
rcadsp47	0.392	0.294	0.109	0.022	0.023	0.345

Note. The Kaiser-Meyer-Olkin (KMO) = 0.84 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(1225, 453) = 22195.13$, $p = 0.000$, revealed adequate sampling accuracy.

Table J1

Rotated Factor Loadings for the Five-Factor Model – Measures Removed

	PA1	PA2	PA3	PA4	PA5
conners1	0.719	0.042	-0.008	0.046	0.059
conners5	0.592	-0.083	0.104	0.021	0.447

conners7	0.509	-0.084	0.115	-0.023	0.514
conners9	0.320	0.060	-0.027	0.458	0.337
conners11	0.473	-0.070	-0.015	0.504	0.083
conners12	0.762	0.117	0.006	-0.025	0.000
conners13	0.532	-0.008	0.051	-0.009	0.467
conners15	0.816	-0.002	0.011	0.143	-0.074
conners16	0.048	-0.074	0.106	-0.532	-0.261
conners17	0.847	0.014	0.005	-0.006	-0.015
conners20	0.774	0.049	-0.012	0.013	0.008
conners28	0.576	-0.042	0.126	-0.114	0.451
conners32	0.874	0.105	-0.007	0.046	-0.104
conners34	0.824	-0.022	0.126	0.004	0.092
conners35	0.695	-0.024	0.074	0.051	0.003
conners37	0.151	-0.046	0.071	0.080	0.412
conners42	0.810	0.166	-0.004	0.055	-0.126
rcadsp1	0.098	0.456	0.305	0.149	-0.006
rcadsp2	0.073	0.095	0.059	0.333	0.182
rcadsp4	0.023	0.816	0.001	-0.066	0.043
rcadsp5	-0.025	-0.031	0.853	-0.014	-0.145
rcadsp6	0.085	0.036	0.038	0.719	0.181
rcadsp7	0.252	0.566	0.076	0.063	-0.112
rcadsp8	0.085	0.543	0.275	-0.115	-0.172
rcadsp9	0.096	0.063	0.716	-0.031	-0.033
rcadsp11	0.266	0.025	0.357	0.162	0.196
rcadsp12	0.182	0.805	0.017	-0.187	-0.029
rcadsp13	-0.041	0.175	0.606	0.109	0.121
rcadsp15	0.202	-0.024	0.059	0.395	0.103
rcadsp17	0.139	-0.195	0.858	-0.068	-0.086
rcadsp18	0.010	0.351	0.281	0.267	0.162
rcadsp19	0.073	-0.025	0.107	0.788	-0.407
rcadsp20	-0.023	0.656	0.037	0.147	-0.039
rcadsp21	0.194	0.197	0.075	0.413	-0.189
rcadsp25	0.572	0.207	0.034	0.199	0.046
rcadsp27	-0.151	0.338	0.535	0.141	0.183
rcadsp29	0.019	0.475	0.095	0.322	0.229
rcadsp30	0.119	0.823	0.010	-0.097	-0.104
rcadsp32	-0.097	0.806	0.026	0.068	0.070
rcadsp33	0.094	0.124	0.294	0.426	0.142
rcadsp34	-0.030	0.135	0.474	0.360	0.207
rcadsp35	-0.035	0.407	0.464	0.110	0.104
rcadsp37	0.015	0.120	0.414	0.165	0.178
rcadsp38	0.268	0.351	-0.033	0.334	-0.166
rcadsp40	0.098	-0.024	0.116	0.654	-0.024

rcadsp41	-0.087	0.220	0.454	0.257	0.172
rcadsp43	-0.011	0.709	-0.063	0.203	0.028
rcadsp45	-0.069	0.183	0.716	0.018	0.088
rcadsp46	0.146	0.043	0.649	0.036	-0.011
rcadsp47	0.451	0.009	0.312	0.054	0.316

Note. The Kaiser-Meyer-Olkin (KMO) = 0.84 (Kaiser & Rice, 1974), and Bartlett's test, $\chi^2(1225, 453) = 22195.13$, $p = 0.000$, revealed adequate sampling accuracy.

Appendix K

Analysis of Characteristic Differences Between Cluster 1 and Cluster 2 – Referred Sample

Table K1

Proportion of Males and Females in Cluster 1 and Cluster 2 – Referred Sample

		cluster 1 (N)	2 (N)	Total
Sex	Male (N)	132	84	216
	Female (N)	60	34	94
Total		192	118	310

Table K2

Chi Square Analysis of Gender Differences between Cluster 1 and Cluster 2 – Referred Sample

	Value	df	p
Pearson Chi-Square	.205 ^a	1	.650

Table K3

T-test Results for Differences in Age between cluster 1 and cluster 2 – Referred Sample

<i>Factor</i>	<i>Cluster 1 Mean Item M (SD)</i>	<i>Cluster 2 Mean Item M (SD)</i>	<i>F</i>	<i>p</i>	<i>t</i>	<i>df</i>	<i>p</i>
Age (in months)	123.59 (30.2)	1.02 (26.09)	1.410	.236	-.229	308	.819