Parental Psychopathology in Families of Children with ADHD: A Meta-analysis

by

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Abstract

There is a large body of literature that examines the association between parental psychopathology and child ADHD. The strength of the relationship varies across studies due to differences between the sample characteristics and methodologies utilized. A meta-analysis was conducted to evaluate the strength of the association between parental psychopathology and ADHD to review the research findings and to establish the degree and size of the effect. The present study included published and unpublished research that considered a quantitative comparison between parental psychopathology status or symptomatology and child ADHD status or symptomatology. Parents of children with ADHD had higher rates of psychopathology symptoms than parents of children without ADHD (d = 0.39; 95% CI [0.31, 0.48], $p < .001$, k = 32). Approximately 16.96% of parents of children with ADHD had a mental disorder (95% CI [14.37, 19.91], $p < .001$, k = 49). Parents of children with ADHD had 2.85 times the odds of parents of children without ADHD of having a mental disorder (95% CI [1.77, 4.59], $p < .001$, k = 18). Type of publication was the only moderator analysis that was statistically significant (Q = 5.70, p = .017, k = 21). Unpublished reports were associated with larger effect sizes in comparison to published journal articles; however, two of the unpublished reports were identified as outliers. Clinicians and researchers will benefit from the results of this research by developing a better understanding of impact parental psychopathology may have on treatment outcomes.

Keywords: meta-analysis, ADHD, family systems, parental psychopathology, family factors

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Attention-deficit/hyperactivity disorder

Attention-deficit/hyperactivity disorder (ADHD) is one of the most commonly diagnosed childhood disorders with prevalence rates estimated at 5% (American Psychiatric Association [APA], 2013). ADHD is classified in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) as a neurodevelopmental disorder (APA, 2013). Neurodevelopmental disorders are broadly defined as disorders that emerge in early development and consist of deficiencies in several domains, including academic, social skills, and personal. The diagnostic features of ADHD are characterized into three domains: a) inattention, b) hyperactivity, and c) impulsivity. Inattention refers to difficulties with staying on task, maintaining focus, and being organized that are not the direct cause of deviant behaviour or problems with understanding (APA, 2013). Hyperactivity consists of inappropriate activity that is often excessive in nature, such as running around, fidgeting, talkativeness, and overall restlessness (APA, 2013). Impulsivity is characterized by uninhibited actions, spur-of-the-moment decision-making, and is often driven by immediate gratification (APA, 2013). The aforementioned diagnostic features of ADHD are reflected in the three main presentations of ADHD: a) combined presentation, b) predominantly inattentive presentation, and c) predominantly hyperactive/impulsive presentation (APA, 2013). ADHD has been shown to be highly comorbid with both externalizing and internalizing disorders, including anxiety disorders (Mancini, Van Ameringen, Oakman, & Figueiredo, 1999; Pliszka, Carlson, & Swanson, 1999; Spencer, Biederman, & Wilens, 1999) and mood disorders (Arnold et al., 2012; Biederman, Faraone, Mick, Moore, & Lelon, 1996; Willcutt et al., 2012). However, ADHD in childhood is most commonly paired with other externalizing disorders including oppositional defiant disorder

(ODD) and conduct disorder (CD; Biederman, Newcorn, & Sprich, 1991; Hinshaw, 1987; Lahey, Schaughency, Hynd, Carlson, & Nieves, 1987; Willcutt et al., 2012). Externalizing disorders are a group of mental disorders characterized by emotion and behaviour regulation problems (Eisenberg, Smith, Sadovsky, & Spinrad, 2004; Hinshaw, 2003).

Risk factors and etiology. Researchers have described ADHD as a familial disorder (Biederman et al., 1995; Faraone, Biederman, Mennin, & Russell, 1998; Faraone & Doyle, 2000; Rasmussen et al., 2002; Spencer, Biederman, Wilens, & Faraone, 1994). The risk factors associated with ADHD include both psychosocial (Pressman et al., 2006; Theule, 2012; Timimi & Taylor, 2004) and biological components (Hawi et al., 2013; Stergiakouli, Hamshere, & Thapar, 2012). Biederman and colleagues (1995) identified a key set of family-environment risk factors for ADHD, which included low socioeconomic status (SES), maternal psychopathology, paternal delinquency, large family size, familial discord, and foster placement. The authors argue that combinations of the aforementioned variables exacerbate the risk for ADHD above and beyond a single risk factor alone. Another potential psychosocial contribution to the disorder are parent-child interactions, specifically, attachment styles. Attachment styles can be categorized in two broadly labeled groups consisting of secure attachment and insecure attachment types (Ainsworth, 1979); more recently, a third category, disorganized attachment, has been introduced (Green, Stanley, & Peters, 2007). A meta-analysis conducted by Theule (2012) found a moderate degree of overlap between ADHD and attachment insecurity and attachment disorganization. This demonstrates that a negative parent-child interaction may play a role in the risk of ADHD. Banerjee, Middleton, and Faraone (2007) note the idea of gene-environment interactions as possible risk factors for ADHD. The concept of gene-environment interaction is based on the idea that observable characteristics are the result of certain genes in

combination with the presence of an environmental factor (Boomsma & Martin, 2002). For example, Banerjee and colleagues noted individuals with a specific allele had higher ratings of ADHD symptoms only when the individual was also exposed to prenatal smoking.

In terms of the biological components of psychopathology, there is a large body of literature that suggests genetics play an important role in the development of mental disorders (Eaves et al., 1997; Gottesman & Gould, 2003; Kendler, 2001; Moffitt, 2005). Twin studies have been often used to tease apart environmental and genetic aspects of a disorder (Hudziak et al., 1998; Thapar, Harrington, & McGuffin, 2001). Some of the most fascinating and notable research conducted in the biological literature are the Virginia Twin studies (e.g., Eaves et al., 1997; Hewitt et al., 1997; Kendler, 2001; Kendler, Neale, Kessler, Heath, & Eaves, 1993; Kendler & Prescott, 1999), where researchers found that many psychiatric disorders are highly heritable and ADHD is no exception (Burt, Krueger, McGue, & Iacono, 2001; Silberg et al., 1996; Simonoff et al., 1997). Monozygotic twins have been found to exhibit more similar ADHD symptoms than dizygotic twins (Neuman et al., 2001; Stevenson, 1992). Furthermore, the majority of the etiological literature on ADHD has focused on possible biological etiologies as the predominant explanation for the range of symptoms that arise in individuals diagnosed with ADHD (e.g., Hawi et al., 2013; Stergiakouli et al., 2012). Specifically, research has suggested there are several strong genetic risk factors for ADHD, such as chromosomal risk regions, allelic variants, and impairments in neural pathways (Khan & Faraone, 2006). Second-degree relatives of children with ADHD have also been noted to have a higher prevalence of ADHD compared to relatives of children without ADHD (Biederman et al., 1992; Biederman, Faraone, Keenan, Knee, & Tsuang, 1990; Faraone, Biederman, & Milberger, 1994). In addition, a genetic explanation for ADHD has been further supported by research that has found a higher

prevalence of parental psychopathology in biological than adoptive families of children with ADHD (Cantwell, 1975; Morrison & Stewart, 1973; Sprich, Biederman, Crawford, Mundy, & Faraone, 2000).

Childhood ADHD. Childhood ADHD is related to impairments in the domains of academics, behaviour, and social interactions at school and within the home (Hinshaw & Melnick, 1995; Johnston & Mash, 2001; Loe & Feldman, 2007). In comparison to families of children without ADHD, families of children with ADHD experience more conflicts (Kendall, 1999; Taylor, Sandberg, Thorley, & Giles, 1991) and tend to have a more intense degree of sibling rivalry (Hechtman, 1996; Mikami & Pfiffner, 2008). Research has also shown that there tends to be a lack of cohesion in families of children with ADHD (Banerjee et al., 2007). Families of children with ADHD face unique challenges resulting in a host of additional familial problems including higher levels of conflict, parenting stress, and parental psychopathology (Hechtman, 1996; Nigg & Hinshaw, 1998; Theule, Wiener, Tannock, & Jenkins, 2013).

Parental Psychopathology

Research has shown a link between several types of parental psychopathology and child ADHD (Biederman et al., 1990; Faraone, Biederman, Keenan, & Tsuang, 1991; Ghanizadeh, Mohammadi, & Moini, 2008; Nigg & Hinshaw, 1998). Parental ADHD is one of the most common types of parental psychopathologies associated with child ADHD (Alberts-Corush, Firestone, & Goodman, 1986; Biederman et al., 1990, 1992; Chronis et al., 2003; Faraone et al., 1991; Weinstein, Apfel, & Weinstein, 1998). Research has also provided evidence that many other psychiatric disorders are more common in the parents of children with ADHD compared to the parents of children without ADHD, including depressive disorders (Biederman, Faraone, Keenan, & Tsuang, 1991; Faraone et al., 1991; Nigg & Hinshaw, 1998), anxiety disorders

(Ghanizadeh et al., 2008; Nigg & Hinshaw, 1998; Weinstein et al., 1998), bipolar and related disorders (Arnold et al., 2012; Klassen, Katzman, & Chokka, 2010; Kowatch, Youngstrom, Danielyan, & Findling, 2005), substance-related and addictive disorders (Clark, Cornelius, Wood, & Vanyukov, 2004; Pelham & Lang, 1993; Weinstein et al., 1998), personality disorders (Faraone et al., 1991; Weiss et al., 1996), and schizophrenia spectrum and other psychotic disorders (Cornblatt & Keilp, 1994; Keshavan et al., 2008; Ross & Compagnon, 2001).

ADHD. ADHD begins in childhood and symptoms often persist into adulthood (APA, 2013; Biederman, Mick, & Faraone, 2000; Resnick, 2005). The prevalence of ADHD in adulthood is approximately 2.5% (APA, 2013). There is evidence that parental ADHD is a risk factor for ADHD diagnosis of future offspring (Alberts-Corush et al., 1986; Biederman, Faraone, & Monuteaux, 2002; Chronis et al., 2003). Researchers have estimated that a large majority of parents with ADHD will have a child with ADHD and consequently about one quarter of children presenting with ADHD will have an ADHD parent (Faraone & Biederman, 1997). Parental ADHD has been associated with maladaptive parenting strategies (Chen & Johnston, 2007; Chronis-Tuscano et al., 2008; Mokrova, O'Brien, Calkins, & Keane, 2010; Murray & Johnston, 2006) and impaired emotional responsiveness (Chronis-Tuscano et al., 2008; Johnston, Mash, Miller, & Ninowski, 2012). Literature on ADHD treatment outcomes demonstrates high dropout rates among parents with ADHD, which further contributes to the reduction of optimal treatment results (Chronis, Chacko, Fabiano, Wymbs, & Pelham, 2004; Evans, Vallano, & Pelham, 1994; McMahon, Forehand, Griest, & Wells, 1981). Furthermore, parents with ADHD have the tendency to seek out alternative treatment options for their children that produce quicker results (Weiss, Hechtman, & Weiss, 2000).

Depressive disorders. Depressive disorders are most commonly characterized by feelings of sadness, emptiness, or irritability in addition to cognitive and physiological changes that impair everyday functioning (APA, 2013). The 12-month prevalence of major depressive disorder (MDD) in the United States (U.S.) is 7% (APA, 2013). Research has demonstrated that relatives of children with ADHD are more likely to have a history of MDD compared to relatives of children without ADHD (Biederman, Faraone, Keenan, & Tsuang, 1991; Faraone et al., 1991; Nigg & Hinshaw, 1998). In addition, mothers of children with ADHD alone had higher scores on the Beck Depression Inventory (BDI) than mothers of children without ADHD and mothers of children with ADHD and ODD (Befera & Barkley, 1985; Chronis et al., 2003; Cunningham, Benness, & Siegel, 1988; Cunningham & Boyle, 2002). As well, child ADHD symptoms were positively correlated with symptoms of maternal depression (Schatz, 2012). However, other studies have found that mothers of children with ADHD did not report higher levels of depression compared to mothers of children without ADHD (Barkley, Fischer, Edelbrock, & Smallish, 1991; Elgar, Curtis, McGrath, Waschbusch, & Stewart, 2003; Elgar, Waschbusch, McGrath, Stewart, & Curtis, 2004).

Anxiety disorders. Anxiety disorders are defined in the DSM-5 by the presence of excessive fear, anxiety, and behavioural disturbances (APA, 2013). The various types of anxiety disorders differ based on the feared object or situation and the corresponding reaction, thought, or belief (APA, 2013). The 12-month prevalence of anxiety disorders among adults in the U.S. ranges from 0.9% to 11.2% (APA, 2013). Symptoms of anxiety have been found to be more common in parents of children with ADHD than parents of children without ADHD (Biederman et al., 1992; Ghanizadeh et al., 2008; Nigg & Hinshaw, 1998; Segenreich, Fortes, Coutinho, Pastura, & Mattos, 2009).

Bipolar and related disorders. Bipolar and related disorders are characterized by episodes of depression and mania or hypomania (APA, 2013). It is important to note that bipolar and related disorders have been classified as a separate category from Depressive Disorders. The 12-month prevalence of bipolar and related disorders among adults in the U.S. is approximately 1.8% (APA, 2013). Although current research suggests a high comorbidity rate of ADHD with bipolar and related disorders (Arnold et al., 2012; Klassen et al., 2010; Kowatch et al., 2005), there are discrepancies within the literature as to whether an association between parental symptoms of bipolar and related disorders and child ADHD exists (Arnold et al., 2012; Chang, Steiner, & Ketter, 2000; Singh et al., 2007).

Substance-related and addictive disorders. Substance-related and addictive disorders are broadly defined as the excessive use of drugs, which result in the direct activation of the reward system (APA, 2013). The 12-month prevalence of substance-related and addictive disorders among adults in the U.S. varies considerably across racial-ethnic subgroups and depends on the substance class. The highest 12-month prevalence rate of a substance-related and addictive disorder is alcohol use disorder (8.5%; APA, 2013). Research on substance-related and addictive disorders in parents of children with ADHD is mixed (Johnston & Mash, 2001). Some researchers have noted that there are higher rates of alcohol consumption in families of children with ADHD (Pelham & Lang, 1993) and children of parents with substance-related and addictive disorders have an increased risk for psychopathologies, such as ADHD (Clark et al., 2004). Other studies have indicated that parents of children with ADHD actually have lower rates of substance-related disorders and alcohol-related disorders compared to parents of children without ADHD (Nigg & Hinshaw, 1998; Schachar & Wachsmuth, 1990).

Schizophrenia spectrum and other psychotic disorders. Schizophrenia spectrum and other psychotic disorders are disorders that consist of one or more of the following diagnostic features: a) delusions, b) hallucinations, c) disorganized thinking (speech), d) grossly disorganized or abnormal motor behaviour (including catatonia), and e) negative symptoms (APA, 2013). There are five main disorders that fall under the category of schizophrenia spectrum and other psychotic disorders, which vary in severity of symptoms and prevalence rates, ranging from 0.2% to 0.7% (APA, 2013). Research has found an increased severity of ADHD symptoms, such as attention deficits, in children of parents with schizophrenia (Cornblatt & Keilp, 1994). Furthermore, studies have found that ADHD was the most common diagnostic classification of children of parents with schizophrenia, even more so than psychosis (Keshavan et al., 2008; Ross & Compagnon, 2001).

Personality disorders. Personality disorders are characterized by persistent behaviour patterns that differ from cultural norms (APA, 2013). The behaviour is described as fixed and is observed as stable across situations, resulting in functional impairments (APA, 2013). There are ten different personality disorders classified in the DSM-5, which greatly vary in behaviour patterns, symptoms, and severity. For the purpose of this study, only two were examined, antisocial personality disorder (ASPD) and borderline personality disorder (BPD). ASPD and BPD were specifically selected for this study due to the fact that both disorders share one of the key diagnostic features of ADHD, impulsivity (APA, 2013; Links, Heslegrave, & Reekum, 1999; Swann, Lijffijt, Lane, Steinberg, & Moeller, 2009). The 12-month prevalence rate of ASPD ranges from 0.2% to 3.3% and the median population prevalence of BPD is approximately 1.6%, but there is speculation that the actual prevalence rate is much higher (APA, 2013). While the risk for ASPD in relatives of individuals with ADHD is higher than in individuals without

ADHD, the relationship was found to be stronger in individuals with comorbid ADHD and CD or ADHD and ODD (Biederman et al., 1992; Faraone et al., 1991). With regards to BPD, children of mothers with BPD as compared to children of mothers without BPD have higher prevalence rates of ADHD and impulse control problems (Weiss et al., 1996) and are at an increased risk of emotional and behavioural problems (Barnow, Spitzer, Grabe, Kessler, & Freyberger, 2006; Stepp, Whalen, Pilkonis, Hipwell, & Levine, 2012). In addition, ASPD and BPD have both been found to co-occur with ADHD (Biederman et al., 1991; Davids & Gastpar, 2005).

Psychopathology Within the Family System

Parental psychopathology in families of children with ADHD has been shown to exacerbate problems within the family system, such as increased likelihood of unsuccessful treatment outcomes (Weiss et al., 2000), higher levels of parenting stress (Theule et al., 2013), risk of child psychopathology (Barkley, Anastopoulos, Guevremont, & Fletcher, 1992; Fendrich, Warner, & Weissman, 1990; Theule et al., 2013), and familial and marital discord (Fendrich et al., 1990). Research has shown that compared to mothers without ADHD, mothers with ADHD often experience negative parent-child relationships, have more difficulty managing emotions, experience greater personal distress, and are generally less satisfied in their marriages (Barkley et al., 1992; Weinstein et al., 1998). In addition, a relationship has been found between marital and familial discord, child behaviour problems, and negative mental health outcomes (Biederman et al., 1995; Fendrich et al., 1990). Furthermore, research has demonstrated a reciprocal negative effect between child ADHD symptomatology and parental psychopathology (Cummings & Davies, 1999) and parental psychopathology has also been linked to child psychopathology and additional behaviour problems (Barnow et al., 2006; Fendrich et al., 1990; Stepp et al., 2012).

Specifically, Fendrich and colleagues (1990) found that parental psychopathology might result in an earlier onset of psychopathology in children. In summary, parental psychopathology, child psychopathology, parenting stress, and familial discord all appear to be interconnected (Fendrich et al., 1990; Theule et al., 2013).

Rationale for the Present Study

There are discrepancies within the literature with regards to the strength of the association between parental psychopathology and child ADHD. Numerous studies report that parental psychopathology is highly prevalent in families of children with ADHD (e.g., Biederman et al., 1990; Faraone et al., 1991; Ghanizadeh et al., 2008; Schachar & Wachsmuth, 1990), whereas other studies have found no association (Lahey et al., 1988; Stewart, deBlois, & Cummings, 1980). Other research has noted that families of children with comorbid ADHD and other externalizing disorders have a higher degree of parental psychopathology (Barkley et al., 1990, 1991, 1992; Johnston, 1996; Lahey et al., 1988; Taylor et al., 1991). Furthermore, it can be argued that co-occurring externalizing disorders in ADHD are linked to parental psychopathology above and beyond ADHD symptomatology alone (Barkley et al., 1992; Biederman et al., 1992; Faraone et al., 1991; Lahey et al., 1988). Meta-analyses are an efficient method of summarizing and analyzing mixed findings within the literature (Berman & Parker, 2002; Borenstein, Hedges, Higgins, & Rothstein, 2009; Lipsey & Wilson, 2001). A meta-analysis was conducted to clarify the strength of the association between parental psychopathology and child ADHD and determine whether parental psychopathology is in fact related to ADHD as a separate entity from co-occurring externalizing disorders. Furthermore, this study explored whether the strength of the association between parental psychopathology

and child ADHD is stronger in families of children with comorbid ADHD and co-occurring externalizing disorders than families of children with ADHD alone.

A meta-analysis conducted by Connell and Goodman (2002) provides the most recent review of the literature pertaining to parental psychopathology and child externalizing behaviour problems. This article examined a variety of parental mental health problems in relation to both externalizing behaviour problems and internalizing behaviour problems. Studies of children's externalizing behaviour problems in the meta-analysis included studies with outcome measurements of aggression, CD, and delinquency, and samples of children with diagnoses of ADHD, CD, and/or ODD. Parental mental health problems investigated in this study included substance use disorders, depression, anxiety, antisocial personality disorder, schizophrenia, and bipolar disorder. A total of 146 studies on parental mental health problems and externalizing behaviour problems were included in the analysis, including 90 studies on maternal mental health problems and 56 studies on paternal mental health problems. Ninety different effect sizes established that the overall effect size for the relationship between maternal mental health problems and externalizing behaviour problems was small. Effect sizes were interpreted based on Cohen's guidelines (1977, 1988) and were categorized as small (d: ≤ .20; r: ≤ .10), medium, (d: 21 to .79; r: .11 to .39) or large (d: ≥ .80; r: ≥ .40). In addition, based on 56 different effect sizes, the association between paternal mental health problems and externalizing behaviour problems was also small. The study also found a difference between the association of paternal disorders and maternal disorders in terms of externalizing behaviour problems. Mothers with internalizing disorders, such as depression and anxiety, were more likely to have a child with an internalizing disorder, but not an externalizing disorder. Whereas fathers and mothers with substance abuse problems were more likely to have children with externalizing disorders, such as

ADHD. Paternal anxiety and maternal and paternal schizophrenia, and bipolar affective disorder were not found to be associated with externalizing behavior problems. Due to the large number of studies included in the analysis, it was possible to conduct several moderator analyses. In terms of gender differences, externalizing behaviour problems in girls were more highly associated with paternal psychopathology, whereas externalizing behaviour problems in samples of boys and girls were more related to maternal psychopathology. The mean age of children in the sample was found to moderate the size of the association between parental psychopathology and externalizing behaviour problems exhibited in the children. To examine the differences between age groups, children were grouped by early childhood (younger than 6 years), middle childhood (6-13 years), and adolescence (older than 13 years). In terms of externalizing problems, the study found that maternal psychopathology was significantly higher in the early childhood group, while paternal psychopathology was highest in the adolescent group. In addition, year of publication was significantly related to both maternal and paternal psychopathology and children's externalizing behaviour problems. Specifically, the authors found that more recent reports were associated with smaller effect sizes compared to earlier reports.

Although the meta-analysis conducted by Connell and Goodman (2002) provides a rich source of information regarding the interconnection of child and parental psychopathologies, the present study further adds to the literature in a few ways. First of all, Connell and Goodman grouped all of the studies on externalizing behaviour problems together. The present study aims to examine ADHD both exclusively and in combination with CD and ODD. One of the main objectives of this present study is to demonstrate whether parental psychopathology is associated with ADHD as a separate entity from other externalizing disorders. In addition, Connell and

Goodman excluded studies that did not provide separate data on mothers and fathers; however, the present study does not exclude those studies. Rather than excluding these studies, gender composition of the parent sample was used in a moderator analysis. Specifically, the percentage of mothers in each sample was evaluated relative to its effect size. Furthermore, given that the study by Connell and Goodman was conducted 13 years ago, the present study updates the findings by including the research that has been conducted since then.

Given that treatment plans for children with ADHD often involve the parents, it is important to take into consideration the mental health of the parents when creating treatment plans for children with ADHD. Parents with mental disorders may have difficulties carrying out treatment plans for their children with ADHD (Sonuga-Barke, Daley, & Thompson, 2002; Webster-Stratton & Hammond, 1990; Weiss et al., 2000). The results of a meta-analysis conducted by Charach and colleagues (2011) found that parent behavioural training was an effective intervention for children with ADHD and therefore, parental involvement in the child's treatment is important. Given this finding, it is important to be conscious of the possible psychopathologies in parents and be aware of how the health of the parent may impact treatment outcomes.

Research Questions

The present study sought to answer the following research questions:

1. What is the prevalence of parental psychopathology in families of children with ADHD?
2. What is the prevalence of ADHD in parents of children with ADHD?
3. What is the prevalence of depressive disorders in parents of children with ADHD?
4. What is the prevalence of bipolar and related disorders in parents of children with ADHD?
5. What is the prevalence of anxiety disorders in parents of children with ADHD?

6. What is the prevalence of substance-related and addictive disorders in parents of children with ADHD?

7. What is the prevalence of schizophrenia spectrum and other psychotic disorders in parents of children with ADHD?

8. What is the prevalence of antisocial personality disorder in parents of children with ADHD?

9. What is the prevalence of borderline personality disorder in parents of children with ADHD?

10. Do parents of children with ADHD have increased odds of parental psychopathology compared to parents of children without ADHD?

11. Do parents of children with ADHD and co-occurring externalizing behaviour problems (ODD/CD) have increased odds of parental psychopathology compared to parents of children with ADHD alone?

12. Do parents of children with ADHD have higher rates of psychopathology symptomatology than parents of children without ADHD? If so, how large is this effect?

13. How large is the association between children's ADHD symptomatology and parental psychopathology symptomatology?

14. How large is the association between children's symptoms of inattentiveness and parental psychopathology symptomatology?

15. How large is the association between children's symptoms of hyperactivity/impulsivity and parental psychopathology symptomatology?

Moderator Analyses

The following moderators were analyzed to examine their effect on the association between children's ADHD symptomatology and parental psychopathology symptomatology:

1. Does the percentage of co-occurring externalizing behaviour problems in the child sample moderate the degree of parental psychopathology?

2. Does the ADHD presentation (combined presentation, predominantly inattentive presentation, or predominantly hyperactive/impulsive presentation) composition of the child sample moderate the degree of parental psychopathology?

3. Does the gender composition of the child sample moderate the degree of parental psychopathology?

4. Does the mean age of the child sample moderate the degree of parental psychopathology?

5. Does the gender composition of the parent/caregiver sample moderate the degree of parental psychopathology?

6. Does the mean age of the parent/caregiver sample moderate the degree of parental psychopathology?

7. Does the level of education of the parent/caregiver sample (percent who completed high school) moderate the degree of parental psychopathology?

8. Does the family type (intact vs. not intact) composition of the sample moderate the degree of parental psychopathology?

9. Does the mean number of children in each family of the sample moderate the degree of parental psychopathology?

10. Does the racial background composition of the child sample in North American samples moderate the degree of parental psychopathology?

11. Does the country of study moderate the degree of parental psychopathology?

12. Does the type of publication (published vs. unpublished, journals vs. dissertations) moderate the degree of parental psychopathology?

13. Does the year of publication moderate the degree of parental psychopathology?

Research Hypotheses

Based on previous literature on parental psychopathology in families of children with ADHD, it is expected that there will be an increased prevalence of parental psychopathology in families of children with ADHD (Connell & Goodman, 2002; Nigg & Hinshaw, 1998; Segenreich et al., 2009; Steinhausen et al., 2013). In addition, parents in families of children with comorbid ADHD and other externalizing problems will be expected to have greater odds of psychopathology than families of children with ADHD only (Barkley et al., 1990, 1991, 1992; Johnston, 1996; Lahey et al., 1988; Taylor et al., 1991). Families of children with different ADHD presentations or a greater degree of symptoms of specific ADHD presentations will not be expected to differ in the level of parental psychopathology compared to families of children classified with other ADHD presentations (Faraone et al., 2000; Hudziak et al., 1998; Knopik et al., 2005; Neuman et al., 1999; Sherman, Iacono, & McGue, 1997; Smalley et al., 2000).

Several predictions regarding the influence of moderators on the association between parental psychopathology symptomatology and child ADHD symptomatology have been made based on the findings of previous literature. Taking into consideration previous research on the differences between ADHD presentation types (Faraone et al., 2000; Hudziak et al., 1998; Knopik et al., 2005; Neuman et al., 1999; Sherman et al., 1997; Smalley et al., 2000), it is anticipated that ADHD presentation type will not moderate the degree of parental psychopathology. In terms of gender composition of the child as a moderator, one study found no child gender differences in terms of parental depression (Gaub & Carlson, 1997), while another study uncovered child gender differences when examining paternal versus maternal psychopathology (Connell & Goodman, 2002). Specifically, the authors found that samples with

a higher composition of girls, had a larger effect in terms of paternal psychopathology, but not maternal psychopathology, while samples with a higher percentage of boys, had a larger effect in terms of maternal psychopathology, but not paternal psychopathology. However, given that child gender, as a moderator, will be examined based on overall parental psychopathology, gender differences are not expected. Given that sample compositions consisting of either a younger age group (younger than 6 years) or an older age group (older than 13 years) have been found to be associated with a larger effect size of parental psychopathology (Connell & Goodman, 2002), it is predicted that mean age will be a significant moderator. Specifically, it is anticipated that a U-shaped or curvilinear relationship will be detected, where samples with either a younger age group or an older age group will have a larger effect size of parental psychopathology compared to samples with mean ages that fall within the middle childhood category. Based on previous literature, which suggested a stronger association between maternal psychopathology than paternal psychopathology in families of children with ADHD (Biederman et al., 1995; Low & Stocker, 2005; Nigg & Hinshaw, 1998; Segenreich et al., 2009), it is expected that the gender composition of the parent/caregiver sample will moderate the degree of parental psychopathology. In consideration of family-environment risk factors for ADHD (Banerjee et al., 2007; Biederman et al., 1992; Biederman et al., 1995), it is anticipated that the mean number of children in each family of the sample and the level of education of the parent/caregiver sample will moderate the degree of parental psychopathology. Specifically, it is predicted that the lower the education of the parent and the larger the family size, the larger the effect size of the association between parental psychopathology and child ADHD symptomatology (Biederman et al., 1995). Due to the large body of literature supporting the genetic component of ADHD, including generational comparisons and twin studies, it is

anticipated that the family type composition of the sample will moderate the degree of parental psychopathology (Cantwell, 1975; Morrison & Stewart, 1973; Sprich et al., 2000), where samples with a high percent of biological families will produce a stronger association between parental psychopathology and child ADHD (Connell & Goodman, 2002). It is expected that racial background composition of the child sample in the North American samples will moderate the degree of parental psychopathology. Given that research has demonstrated that individuals of Asian heritage show more moderacy bias and ambivalence on self-report measures, which may reflect less extreme symptom severity (Paulhus & Vazire, 2007), it is expected that samples with a higher percentage of White participants will produce a stronger association between parental psychopathology and child ADHD. In consideration of the current debate regarding the Westernization of ADHD, in which ADHD has been found to be more prevalent in North America than Asia (Polanczyk, Silva de Lima, Horta, Biederman, & Rohde, 2007; Timimi & Taylor, 2004), it is predicted that the country of study will moderate the degree of parental psychopathology. Specifically, it is predicted that studies conducted in North American countries, including Canada and the U.S., will demonstrate a stronger relationship between parental psychopathology and child ADHD compared to non-North American countries. In addition, given that studies published in journals are more likely report significant findings compared to unpublished studies (Dwan et al., 2008; Easterbrook, Gopalan, Berlin, & Matthews, 1991; Egger & Smith, 1998), it is anticipated that the publication type will be a significant moderator. Finally, it is expected that the year of publication will moderate the relationship between psychopathology and ADHD symptomatology in children, where older studies will have a stronger association between parental psychopathology and child ADHD compared to more recent studies as suggested by previous research (Connell & Goodman, 2002).

Method

Search Strategy and Identification of Studies

A meta-analysis was conducted to summarize and analyze the mixed findings within the literature in terms of the association between parental psychopathology and child ADHD in families of children with ADHD. ADHD was considered in terms of status or symptoms, such as hyperactivity, inattention, or ADHD symptoms overall. The Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines were followed in terms of the identification, screening, and eligibility of the reports included in the study (Moher, Liberati, Tetzlaff, & Altman, 2009). PRISMA is a set of principles created for authors conducting systematic reviews and meta-analyses. The following five databases were systematically searched for both published and unpublished reports prepared up to June 2014: a) PsycINFO, b) Medline, c) Educational Resources Information Center (ERIC), d) Dissertations & Theses (ProQuest), and e) Google Scholar. Given the extensive list of search results produced by Google Scholar, the database was searched up to 200 consecutively irrelevant articles. Both published and unpublished reports were included in this study to reduce possible publication bias (Card, 2012; Dickersin, 2005; Dwan et al., 2008; Easterbrook et al., 1991; Egger & Smith, 1998; Moher et al., 2009). Publication bias is where the results of a study influence the likelihood of a study being published (Dwan et al., 2008; Easterbrook et al., 1991; Egger & Smith, 1998). Specifically, it refers to the idea that studies that produce either statistically significant results or demonstrate practical significance in their respective field are more likely to be published than studies that do not (Dwan et al., 2008; Easterbrook et al., 1991; Egger & Smith, 1998). The exact search strategy for each of the databases varied based on the availability of limiters used to reduce the search results. For example, PsycINFO provided additional options to further narrow

down the search. The following keywords were used in all databases to obtain relevant articles: attention-deficit/hyperactivity disorder, ADHD, ADD, attention deficit disorder, attention deficit disorder with hyperactivity, hyperactivity, hyperkine*, minimal brain damage, minimal brain dysfunction, parent, mother*, father*, parental, maternal, paternal, depression, major depression, mood disorders, anxiety, anxiety disorders, substance use disorders, alcoholism, bipolar, mania, parental ADHD, schizophrenia, psychosis, antisocial personality disorder, and borderline personality disorder. Attempts were also made to obtain additional studies by checking relevant review articles and conference proceedings. ERIC is an extensive database that indexes journal articles, as well as unpublished reports such as conference proceedings, theses, dissertations, and meetings. In addition, journals where prominent researchers in the area of ADHD often publish research were searched, such as the *Journal of Attention Disorders*.

Criteria for Study Selection

The following eligibility criteria were used to determine if a study was eligible:

1. The study was reported in English and published (or prepared) up to June 2014. Both published and unpublished reports were eligible. Studies published online prior to June 2014 were also eligible. The study must be originally published and indexed in English. Studies that were translated into English were not eligible.
2. The study consisted of a quantitative consideration of the relationship between a child's current attention-deficit/hyperactivity disorder (ADHD) status or symptoms and current parental psychopathology that answers one or more of the specified research questions, either within an ADHD group (i.e., correlational or regression studies), or between an ADHD group

and a comparison group (either a typically-developing comparison group or some other clinical group).

3. The study included children diagnosed with ADHD or who met the clinical cut-off for an ADHD diagnosis. Studies consisting of community samples of children with ADHD symptoms were not included.
4. The study included the sample sizes for the children and the parents. Studies were excluded if there were discrepancies in the sample size across children and parents or the sample size was unclear.
5. The study included some measure of current ADHD symptomatology (including hyperactivity, inattention, or ADHD symptoms overall) or previous diagnosis of ADHD or ADD (attention-deficit disorder) by a qualified health professional. Studies providing only past child ADHD measures were excluded.
6. The study included a direct measure or diagnosis of current parental psychopathology (as opposed to overall mental health quality, emotion regulation skills, parental control, parental mood, parental sensitivity, parental worry, parenting stress, parenting styles, or personality traits, etc.). Studies providing only past parental psychopathology measures were excluded.
7. Studies that utilized tools that assessed personality patterns [(e.g., Millon Multiaxial Clinical Multiaxial Inventory (MCMI), Minnesota Multiphasic Personality Inventory (MMPI)] were only used to analyze personality disorders including antisocial personality disorder and borderline personality disorder. These tools were not used to measure other parental psychopathology for the purposes of this meta-analysis. For example, the depressive scale presented in the MCMI-III would not be used to measure MDD for inclusion in this meta-analysis.

8. The study focused on children without developmental difficulties. Studies focusing on children with identified developmental, genetic, or physiological conditions (e.g., Mental Retardation, Autistic Disorder, Asperger's Disorder, Fragile X Syndrome, Fetal Alcohol Syndrome Disorder (FASD), Turner Syndrome, premature birth, toxin-exposure, Traumatic Brain Injury) were not eligible. Studies that included a small number of children with developmental, genetic, or physiological conditions were eligible. Studies focusing on children with a history of child maltreatment were also excluded.
9. Studies focusing on children adopted from orphanages or in foster care were not eligible.
10. Studies including parents/caregivers with identified developmental or genetic conditions (e.g., Mental Retardation, Autistic Disorder, Asperger's Disorder, Fragile X Syndrome, and Turner Syndrome) were not eligible. Studies that included a small number of parents with any of the above conditions were eligible.
11. Studies focusing on parents with a history of incarceration were not eligible.
12. The study included a sample of offspring participants with a mean age of 18 years and under.

The articles produced by the search results from the five separate computerized bibliographic searches were screened for eligibility through multiple steps. The number of articles that were included and excluded at each stage was recorded and is presented in the PRISMA flow diagram (See Figure 1). First, the list of articles from each database was compared against one another to identify duplicate studies. Second, the articles were screened based on the titles and abstracts using the above set of eligibility criteria. Third, all studies with titles or abstracts that appeared relevant to this study moved on to the next screening stage, the full manuscript review. For organizational purposes, each study at this stage was: a) referred to

as a potential study, b) assigned a unique study number, and c) entered into a tracking file. Each manuscript was read in its entirety and was scrutinized using the predetermined set of eligibility criteria. Each article that passed this stage and met all of the 12 points of eligibility criteria was: a) referred to as an eligible study, and b) included in the final analyses. The studies that violated the eligibility criteria were excluded from further analysis and the reasons for exclusion were recorded in the PRISMA flow diagram. Furthermore, each of the eligible articles underwent a backward and forward reference search to find additional studies that may have been missed in the initial database searches (Card, 2012). A backward reference search refers to checking an article's reference list for possible studies that meet the eligibility criteria, whereas a forward reference search is the process of checking for articles that have cited a given article. The articles produced by the backward and forward searching underwent the same screening procedure as mentioned above. The number of studies retrieved through this process were also recorded in the PRISMA flow diagram as additional records identified through other sources.

Coding

A coding manual (see Appendix A) was created based on the research questions and was used as a guideline to code eligible studies. The coding manual provided step-by-step instructions on how to properly code a study and includes study descriptors and outcome measurements. The data from each of the eligible studies was recorded using a coding form (see Appendix B). The essential information that was gathered from each of the studies included: a) type of publication, b) publication year, and c) study location. Specific information on ADHD symptomatology and/or status from each study sample was also recorded for moderator analyses and included: a) diagnostic procedures and measures, b) possible presentations, and c) comorbidity status. Furthermore, the following demographic information on the child and the

caregiver/parent sample was included for moderator analyses: a) gender composition of the sample, b) mean age, c) mean years of education, and d) ethnic/racial background composition of the sample. Additional family characteristics were also recorded: a) the mean number of children within the household, and b) family composition of the sample (biological, foster, blended/step-family). Quantitative data on parental psychopathology provided by each of the studies was recorded on the second half the coding form. To be eligible for this study, articles must have provided data with: a) group comparisons (ADHD vs. control, ADHD vs. ADHD/ODD/CD, or ADHD vs. ODD/CD), b) correlations assessing the degree of ADHD symptomatology and parental psychopathology symptomatology, or c) prevalence of overall or specific types of parental psychopathology. Parental psychopathology outcomes must have included either a diagnosis of a current mental disorder or a quantitative measure of present symptoms. Data from completed coding forms was entered into the Comprehensive Meta-Analysis (CMA) software version 3.0 (Borenstein, Hedges, Higgins, & Rothstein, 2013).

Reliability. Reliability was assessed at two stages of the meta-analysis. The searches were verified for reliability by having a second searcher review all eligible studies in an effort to find others that cited studies already deemed eligible or were listed as references for other studies deemed eligible. Only one additional record was identified in this manner, supporting the thoroughness of the searches. To assess for intercoder reliability, a secondary coder coded 25% of the eligible studies. Given that coding articles is one of the most critical aspects of conducting a meta-analysis, the secondary coder was thoroughly trained and familiarized with the coding manual and coding form (Lipsey & Wilson, 2001). There were no disagreements between the primary coder and the secondary coder and therefore, calculating Cohen's kappa between the two coders was not required (Card, 2012).

Statistical Analysis

Given that heterogeneity across the studies was assumed, a random effects model was used throughout the analyses (Borenstein et al., 2009; Borenstein, Hedges, Higgins, & Rothstein, 2010; Lipsey & Wilson, 2001). A random effects model was chosen for this study because it is expected that there would be a wide range of variation between the studies. Individual meta-analyses were performed to address each of the research objectives. The ability to conduct each meta-analysis for each research question depended on the number of studies that included the required information. Specifically, effect sizes from at least three unique studies were required to conduct a meta-analysis. The overall prevalence of parental psychopathology, as well as specific types of psychopathology present in families of children with ADHD was computed. Specifically, the following classifications of parental psychopathology were examined in this study: a) ADHD, b) depressive disorders, c) anxiety disorders, d) bipolar and related disorders, e) substance-related and addictive disorders, f) schizophrenia spectrum and other psychotic disorders, g) antisocial personality disorder, and h) borderline personality disorder. Odds-ratio effect sizes were calculated to examine the relative odds of the presence of parental psychopathology in families of children with ADHD in comparison to families of children without ADHD. In addition, odds-ratio effect sizes were used to compute the odds of parental psychopathology in families of children with co-occurring externalizing problems (ODD/CD) as compared to families of children with ADHD only. A Pearson product-moment correlation coefficient was used to examine the association between a child's ADHD symptomatology and parental psychopathology. The majority of the articles consisted of bivariate relationships with two continuous variables and therefore, the Pearson product-moment correlation coefficient was the appropriate type of correlation coefficient to use for this study (Lipsey & Wilson, 2001). A

Pearson product-moment correlation coefficient was also used to analyze the association between parental psychopathology and children's symptoms of: a) inattentiveness, b) hyperactivity, and c) impulsivity. A standardized mean difference was used to analyze the degree of the association between child's ADHD diagnostic status and parental psychopathology symptomatology, where the ADHD diagnostic status was the dichotomous variable (present/absent), and the degree of parental psychopathology symptomatology was the continuous variable. While a point-biserial correlation could be used to analyze this particular objective, Lipsey and Wilson (2001) recommend using a standardized mean difference.

When multiple outcome measures of parental psychopathology were provided in a single study, the mean of the outcomes were used in the analysis and were referred to as an aggregated effect size. For example, if a study provided prevalence rates for depression and anxiety, the weighted mean prevalence between the two outcomes were used to assess the overall psychopathology for Research Question 1 (however, the prevalence rates for specific mental disorders were used in Research Questions 2 to 9). Furthermore, the mean of the outcomes were used for studies that provided maternal and paternal measures of psychopathology. Moreover, studies that consisted of multiple subgroups were analyzed using the study as the unit of analysis opposed to using the subgroup within the study as the unit of analysis. Given that the main objective of this study is to analyze parental psychopathology overall, this approach was used when reports separated the data for male and female parents within the study.

Moderator Analyses

All moderator analyses were conducted on the individual meta-analysis examining the association between child's ADHD symptomatology and parental psychopathology symptomatology. The moderator analyses for this study were conducted using either a meta-

regression or an analog ANOVA depending on the specific question. A meta-regression is typically used for continuous variables and was used to evaluate the value of a moderator in each study relative to its effect size (Card, 2012; Lipsey & Wilson, 2001). Individual meta-regressions were conducted for the following continuous moderator variables: a) percent of co-occurring externalizing disorders (ODD/CD) in the sample, b) percent of specific ADHD presentations in the sample, c) gender composition of child sample, d) mean child age, e) gender composition of the parent/caregiver sample, f) mean parent/caregiver age, g) percent of parents who completed high school, h) percent of families who were the biological parents of the children in the sample (family composition), i) mean number of children in family, j) ethnic/racial background composition of the sample, and k) year of publication. An analog ANOVA is used to examine categorical variables and may clarify additional effect size variation (Lipsey & Wilson, 2001). Specifically, analog ANOVA was used to group effect sizes into individual categories and to compare the effect sizes between the groups. Analog ANOVAs were used to examine the following categorical moderator variables: a) country of the study and b) publication type (published vs. unpublished, journals vs. dissertations). The ability to conduct each separate moderator analysis depended on the number of studies that include the required information.

Data Extraction and Missing Data

When multiple reports of the same study were available, published reports were included over unpublished reports except when information was missing from the former. In addition, only one set of results from a single study was included in the analysis. It was expected that not all of the potential studies would provide sufficient information to calculate an effect size. If a potential study met all other eligibility criteria, an effort was made to contact the principal

investigator to request the missing data (Card, 2012). In addition, authors were contacted if the results of their study were reported simply as a non-significant finding (Card, 2012). To be all-inclusive, a meta-analysis should include both significant and non-significant results. Missing outcome data or clarification regarding sample sizes were requested from six authors via email. One of the six authors provided the necessary data to be included in this meta-analysis (Shaw, Lacourse, & Nagin, 2005). Three of the corresponding authors did not respond. Two of the three studies in which the author did not respond were excluded from the meta-analysis. For both of these studies, the sample size of the parents were requested, but not successfully obtained (Ghanizadeh, 2010; Larsson et al., 2013). The remaining study in which the author did not respond was still included in the meta-analysis given that it provided other usable data (Segenreich et al., 2009). The corresponding author of one of the studies responded to the inquiry of missing data, but unfortunately was unable to provide the requested statistics required to be eligible for this study (Kvist, Nielsen, & Simonsen, 2013).

Results

Study characteristics

Search results from five databases produced 7410 unique articles. Reference lists and a list of articles that had cited eligible studies were also searched manually for additional articles that met the inclusion criteria. Through this process, one eligible article (Cantwell, 1972) was found and was included in the final analysis. There were a total number of 379 full-text articles that were reviewed and screened for eligibility. Eight-six (54 journal articles, 32 theses/dissertations) met all the inclusion criteria to be included in the systematic review (Figure 1). The studies were published from 1971 through 2014. Seventy-nine percent of the studies were conducted in North America (n = 68) with the majority of the studies conducted in the U.S.

(n = 61) and seven studies conducted in Canada. There was one study conducted in each of the following countries: Italy, Japan, Netherlands, Slovenia, Turkey, Ukraine, and United Kingdom. The remaining studies were conducted in Australia (n = 3), Brazil (n = 3), Germany (n = 3), and Taiwan (n = 2). Each study contributed between 1 and 50 individual effect sizes (M = 8.50) and between 1 and 8 aggregated effect sizes (M = 2.64). The percentage of female caregivers and the female children in the samples in each study ranged from 0 to 100%. The age range in the samples of children and parents were 3 to 18 years and 21 to 63 years, respectively. The number of individual effect sizes (k) used to answer each research question ranged from 9 to 159 (M = 47.4). The number of aggregated effect sizes used to answer each research question ranged from 4 to 49 (M = 15.3). The overall prevalence of parental psychopathology consisted of the largest number of aggregated effect sizes (k = 49), while prevalence of schizophrenia spectrum and other psychotic disorders (k = 1) and BPD (k = 2) each consisted of the smallest number of effect sizes.

The majority of the studies either examined maternal or parental psychopathology overall (n = 84). Only two studies focused solely on paternal psychopathology (Chang, Chiu, Wu, & Gau, 2013; Romirowsky & Chronis-Tuscano, 2013). Most of the studies utilized self-report measures to assess parental psychopathology. The most commonly used self-report measures were the ADHD Rating Scale-IV (ADHD RS-IV; DuPaul, Power, Anastopoulos, & Reid, 1998), the Adult Self-Report Scale (ASRS; Achenbach & Rescorla, 2003), various versions of the BDI (Beck, Rush, Shaw, & Emery, 1979; Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), Conners' Adult ADHD Rating Scales (CAARS; Conners, Erhardt, & Sparrow, 2003), and the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Some of the studies assessed parental psychopathology through semi-structured clinical interviews, such as

the Structured Clinical Interview (SCID) and the Structured Clinical Interview, Non-Patient Edition (SCID-NP; Spitzer, Williams, & Gibbon, 1990). The scoring of the interviews was often in accordance with the diagnostic criteria of either the current DSM or The International Classification of Diseases (ICD). In addition, eleven of the studies utilized one or more translated versions of a standard assessment tool to measure parental psychopathology and child ADHD. The assessment tools were translated into Chinese (Gau, 2007; Gau & Chang, 2013), Dutch (Richards et al., 2014), German (Freitag et al., 2012; Jans et al., 2013; Steinhausen et al., 2013), Japanese (Satake, Yamashita, & Yoshida, 2004), Portuguese (Chazan et al., 2011; Pheula, Rohde, & Schmitz, 2011; Segenreich et al., 2009), and Russian (Drabick, Gadow, Carlson, & Bromet, 2004).

The majority of studies included a previous diagnosis of ADHD as part of the eligibility criteria for the child participants. Most of the studies utilized a parent-report form to assess child ADHD symptoms. The most commonly used assessments were the Child Behaviour Checklist (CBCL; Achenbach, 1991), the Conners' Parenting Rating Scale-Revised (Conners, 1997), the Disruptive Behavior Disorder (DBD) Symptom Checklist (Pelham, Gnagy, Greenslade, & Milich, 1992), the Behavior Assessment System for Children, Second Edition (BASC-2; Reynolds & Kamphaus, 2004), and the NIMH Diagnostic Interview Schedule for Children (DISC; Shaffer, Fisher, Piacentini, Schwab-Stone, & Wicks, 1993).

Prevalence of Parental Psychopathology

As presented in Table 1, the prevalence of current overall parental psychopathology in parents of children with ADHD was approximately 16.96% (95% CI [14.37, 19.91], $p < .001$, $k = 49$). The results of the prevalence of the specific types of parental psychopathology are displayed in Tables 2-9. In terms of parental ADHD, some of the studies included the rate of the

three specific presentations of ADHD including combined, inattentive, and hyperactive/impulsive. For the purpose of this study, the overall prevalence of ADHD was analyzed and it was found that 21.26% of children with ADHD also had a parent with ADHD (95% CI [18.07, 24.85], $p < .001$, $k = 24$). The prevalence of parental depression was similar to the overall prevalence of parental psychopathology (17.09%, 95% CI [12.33, 23.20], $p < .001$, $k = 22$). The prevalence of bipolar and related disorders in parents of children with ADHD was found to be lower than depression (3.28%, 95% CI [1.48, 7.10], $p < .001$, $k = 5$). A few studies provided the prevalence rates of specific types of anxiety disorders including generalized anxiety disorder, panic disorder, specific phobia, and social phobia (Barron, 1996; Goldstein, 2006; Jans et al., 2013; Lahey et al., 1987; Schatz, 2009; Tang, 2008). The mean event rates across all types of anxiety disorders were used to calculate the overall prevalence of parental anxiety disorders. Fourteen studies examined the prevalence of anxiety disorders in parents of children with ADHD (16.07%, 95% CI [10.24, 24.32], $p < .001$). The overall prevalence of substance-related and addictive disorders in parents of children with ADHD was 14.18% (95% CI [8.18, 23.45], $p < .001$, $k = 9$). A meta-analysis was not conducted on the prevalence of schizophrenia spectrum and other psychotic disorders and BPD due to an insufficient number of effect sizes that provided usable data ($k = 1$; $k = 2$, respectively). The prevalence of ASPD in parents of children was 4.84% (95% CI [2.57, 8.93], $p < .001$, $k = 7$).

Parental Psychopathology Diagnosis and Symptoms

Parents of children with ADHD had 2.85 times the odds of parents of children without ADHD of having a psychopathology (95% CI [1.77, 4.59], $p < .001$, $k = 18$; Table 8). However, as shown in Table 9, parents of children with ADHD and ODD/CD had 1.99 times the odds of parents of children with ADHD only of having a psychopathology, but this effect was not

statistically significant (95% CI [0.70, 5.66], $p = .195$, $k = 4$). As shown in Table 10, parents of children with ADHD had significantly higher levels of psychopathology than parents of children without ADHD ($d = 0.39$, 95% CI [0.31, 0.48], $p < .001$, $k = 32$).

Relationship Between Symptoms of Parental Psychopathology and Child ADHD

As shown in Table 11, the relationship between overall child ADHD symptoms and overall parental psychopathology symptoms was medium ($r = 0.21$, 95% CI [0.15, 0.26], $p < .001$, $k = 21$). Table 12 shows that the relationship between overall child symptoms of inattentiveness and overall parental psychopathology symptoms was also medium ($r = 0.32$, 95% CI [0.21, 0.42], $p < .001$, $k = 11$). In addition, Table 13 demonstrates a medium effect between symptoms of child hyperactivity/impulsivity and parental psychopathology ($r = 0.24$, 95% CI [0.13, 0.35], $p < .001$, $k = 11$).

Outliers

Potential outliers were identified as those with standardized residuals greater than 1.96. Forest plots were produced for each of the research questions and were also used to identify potential outliers by visual inspection. A total of 13 outliers were identified across the fifteen research questions. Less than half of the research questions ($n = 6$) had at least one outlier. On average 3.30% of the studies included in each research question were identified as an outlier. The identified outliers had standardized residual values ranging from -2.76 to 2.87 with a slight majority ($n = 7$) in the positive direction. Effect sizes from nine unique studies were identified as outliers, four of which were dissertations. Effect sizes from four studies were identified as outliers in two different research questions (Barron, 1996; Baumann, Pelham, Lang, Jacob, & Blumenthal, 2004; Cussen, Sciberras, Ukoumunne, & Efron, 2012; Walker, 1999).

Lipsey and Wilson (2001) suggest removing outliers from the effect size distribution by

eliminating the studies from the analysis to produce a trimmed distribution. The trimmed distribution is then compared to the untrimmed distribution to decide whether it would be advantageous to use the trimmed distribution. Outliers were removed from research questions 1, 2, 3, 12, and 13 (See Tables 1, 2, 3, 10, and 11). Five effect sizes were removed to analyze the trimmed summary effect for the prevalence of overall parental psychopathology in parents of children with ADHD. The trimmed overall prevalence (17.32%, 95% CI [15.03, 19.88], $p <$ .001, $k = 44$) was slightly higher than the untrimmed overall prevalence (16.96%, 95% CI [14.37, 19.91], $p < .001$, $k = 49$). After removing one effect size (Walker, 1999), the overall prevalence of ADHD in parents of children with ADHD was slightly lower (20.41%, 95% CI [17.70, 23.41], $p < .001$, $k =23$) than the original prevalence rate (21.26%, 95% CI [18.07, 24.85], $p <$ .001, $k = 24$). The removal of two studies (Baumann et al., 2004; Cussen et al. 2012) from the overall prevalence of depression in parents of children with ADHD produced a slightly larger prevalence rate (17.32%, 95% CI [12.80, 23.00], $p < .001$, $k = 20$) than the untrimmed overall prevalence rate (17.09%, 95% CI [12.33, 23.20], $p < .001$, $k = 22$). The trimmed summary effect of the prevalence of anxiety in parents of children with ADHD (17.92%, 95% CI [11.73, 26.42], $p < .001$, $k = 13$) was slightly higher than the original analysis (16.07%, 95% CI [10.24, 24.32], $p < .001$, $k = 14$). In addition, two outliers were removed to assess the level of psychopathology in parents of children with ADHD compared to parents of children without ADHD. The difference between the trimmed summary effect size ($d = 0.39$, 95% CI [0.32, 0.46], $p < .001$, $k = 30$) and the untrimmed summary effect size ($d = 0.39$, 95% CI [0.30, 0.48], $p < .001$, $k = 32$) was trivial. Finally, two outliers were identified and removed to assess the relationship between overall child ADHD symptoms and overall parental psychopathology symptoms. The trimmed effect size ($r =$ 0.18, 95% CI [0.13, 0.23], $p < .001$, $k = 19$) was slightly lower than the untrimmed effect size (r

= 0.21, 95% CI [0.15, 0.26], $p < .001$, $k = 21$). Overall, although a number of outlying individual effects were identified, there was little change in the weighted mean effects, and none in the significance of the findings; as a result, the untrimmed findings were retained.

Moderator Analyses

Moderator analyses were conducted on all variables that had four or more studies that provided data on that variable. A moderator analysis was not conducted on the mean number of children in each family of the sample due to insufficient number of studies that provided usable data ($n = 3$). The variable for family type (intact vs. not intact) was assessed using the percentage of parents who were the biological parents of the children in the sample in addition to the percentage of parents who reported being married at the time of the study. The number of studies eligible for a given variable ranged from four to twenty-one studies. A total of fifteen moderator analyses were conducted to investigate twelve of the thirteen proposed moderator variables (See Table 14). Type of publication (thesis/dissertation vs. journal article) was the only moderator analysis that was statistically significant ($Q = 5.70$, $p = .017$, $k = 21$). Theses, including both master's theses and doctoral dissertations, were associated with larger effect sizes compared to published journal articles. Two Pearson product-moment correlation coefficients were then used to examine the difference in effect sizes between the theses and journal articles. The theses had a much larger effect size ($r = 0.26$, 95% CI [0.19, 0.33], $p < .001$, $k = 14$) compared to the journal articles ($r = 0.14$, 95% CI [0.08, 0.21], $p < .001$, $k = 7$).

Discussion

The results of this study have demonstrated that parental psychopathology is in fact associated with child ADHD despite the previous arguments that parental psychopathology is not associated with child ADHD without the co-occurrence of CD and ODD (Lahey et al., 1988;

Stewart et al., 1980). Given that the majority of studies included in this meta-analysis were conducted in the U.S., we can consider these results in relation to nationally representative data from the U.S. on rates of psychopathology in the general population. The results of this study found that the overall prevalence of psychopathology in parents of children with ADHD is lower than a nationally representative sample of adults residing in the U.S. (Nicholson, Biebel, Hinden, Henry, & Stier, 2001). Specifically, data from the National Comorbidity Survey (NCS) revealed that approximately one-third of women and one-fifth of men were classified as having at least one past-year mental disorder. That is, participants' endorsed symptoms of various mental disorders based on CIDI criteria and were subsequently classified as having a past year mental disorder (Nicholson et al., 2001). In addition, the report stated that just over 20% of mothers and 10% of fathers in the U.S. have at least one mental disorder. That being said, nationally representative data has the advantage of drawing from the population and aims to reflect the various socioeconomic statuses and racial backgrounds typical of the country. In contrast, researchers that utilize primary data collection including the majority of the studies included in this meta-analysis often draw from a sample of participants from western, educated, industrialized, rich, and democratic (WEIRD; Henrich, Heine, & Norenzayan, 2010) societies.

It was proposed that prevalence rates of nine types of parental psychopathology would be analyzed. However, due to an insufficient number of studies that provided the required data, only seven of the nine were examined. Specifically, the present study was unable to analyze the prevalence of schizophrenia spectrum and other psychotic disorders and BPD. Overall, the prevalence of all types of mental disorders in parents of children with ADHD was found to be higher than the prevalence rates in the general population (APA, 2013). However, the prevalence of parental ADHD (21.26%) was higher than that of parental depression (16.95%).

This finding is not surprising given that adults with ADHD often demonstrate symptoms of depression and adult ADHD has been found to co-occur with mood disorders including major depressive disorder and bipolar disorder (Kessler et al., 2006). In addition, parental depression has been shown to be associated with child emotional and behaviour problems (Goodman et al., 2011). Specifically, children of mothers with depression experience higher rates of negative parent-child interactions (Lee et al., 2013; Lovejoy, Graczyk, O'Hare, & Neuman, 2000), inconsistent and ineffective discipline (Cunningham et al., 1988; Lovejoy et al., 2000), and insecure attachment (Campbell et al., 2004; Martins & Garffan, 2000) compared to children of mothers without depression. In addition, children of mothers with depression are at a greater risk for behavioural problems, including ADHD (Chronis et al., 2007; Elgar et al., 2004; Gartstein & Sheeber, 2004). Given that factors such as insecure attachment (Theule, 2012), and negative parent-child interactions (Danforth, Anderson, Barkley, & Stokes, 1991; Johnston, 1996; Johnston & Mash, 2001) have been found to be associated with ADHD, it is possible that there are a multitude of factors at play in terms of the relationship between parental depression and child ADHD.

The prevalence of parental ADHD is lower than expected given the highly genetic component of ADHD (Hawi et al., 2013; Khan & Faraone, 2006; Sprich et al., 2000). It is possible that the results of this research demonstrate an underestimation of the actual prevalence of parental ADHD in families of children with ADHD. A handful of studies were excluded from this meta-analysis because the participant sample consisted only of children and parents with ADHD (e.g., Griggs & Mikami, 2011; Sonuga-Barke et al., 2002). That is, to be included in the aforementioned studies, the parent and the child samples were required to either have a current diagnosis of ADHD or would potentially met the clinical cut-off for an ADHD diagnosis. Given

that the inclusion criteria of this meta-analysis required a quantitative consideration of the relationship between a child's current ADHD status or symptoms and current parental psychopathology, these studies were not included. That being said, the results of this research are consistent with the notion that the prevalence of ADHD is much higher in parents of children with ADHD than in the general population.

The prevalence of anxiety disorders in parents of children with ADHD was found to be much higher than the general population in terms of 12-month prevalence rates (APA, 2013). The results of this study are consistent with the findings of previous research, which indicates that symptoms of anxiety are more common in parents of children with ADHD than parents of children without ADHD (Biederman et al., 1992; Ghanizadeh et al., 2008; Nigg & Hinshaw, 1998; Segenreich et al., 2009). The prevalence of bipolar and related disorders in parents of children with ADHD was one of the lowest prevalence rates among the mental disorders examined in this study. This finding is consistent with the fact that bipolar and related disorder in the general population has a lower 12-month prevalence rate than the other mental disorders analyzed in this study. That being said, there were was also one fifth of the number of effect sizes ($k = 5$) used to assess the prevalence of bipolar and related disorders compared to most other disorders including ADHD and depression. The prevalence of substance-related and addictive disorders in parents of children with ADHD was lower than the overall prevalence of parental psychopathology, but higher than that of the general population. Finally, the prevalence rate of ASPD in parents of children with ADHD was higher than the 12-month prevalence rate of ASPD.

As demonstrated in previous research, parents of children with comorbid ADHD and other externalizing problems were found to have greater odds of psychopathology than parents of

children with ADHD only (Barkley et al., 1990, 1991, 1992; Johnston, 1996; Lahey et al., 1988; Taylor et al., 1991). It was predicted that children with different ADHD presentations or a greater degree of symptoms of specific ADHD presentations would not differ in the level of parental psychopathology compared to parents of children classified with other ADHD presentations (Faraone et al., 2000; Hudziak et al., 1998; Knopik et al., 2005; Neuman et al., 1999; Sherman et al., 1997; Smalley et al., 2000). However, there was a stronger association between symptoms of child inattentiveness and parental psychopathology than overall child ADHD symptoms and parental psychopathology.

It was proposed that a total of thirteen moderator variables would be analyzed. However, due to an insufficient number of studies that provided the required data, only twelve of the thirteen were examined. Specifically, the present study was unable to analyze whether the mean number of children in each family influenced the association between parental psychopathology symptomatology and child ADHD symptomatology. Only one moderator variable, the type of publication, was found to be significant. Given that studies published in journals are more likely report significant findings compared to unpublished studies (Dwan et al., 2008; Easterbrook et al., 1991; Egger & Smith, 1998), it was expected that the publication type would be a significant moderator. However, the opposite result was found. That is; unpublished reports, such as theses were associated with a larger effect sizes compared to published journal articles. Two of the unpublished reports (Patterson, 2006; Salvato, 2000) were identified as outlier sand removed to examine the trimmed distribution of the unpublished reports ($r = 0.22$, 95% CI [0.15, 0.29], $p < .001$, $k = 12$). When comparing the trimmed distribution of the unpublished reports to the published reports, publication type as a moderator was no longer significant ($Q = 2.73$, $p = .098$, $k = 19$).

The majority of research on parental psychopathology and child externalizing disorders have emphasized that the presence of co-occurring externalizing disorders (e.g., ODD and CD) are more highly associated with parental psychopathology than ADHD alone. However, the results of the moderator analysis demonstrate that the percentage of co-occurring externalizing behaviour problems in the child sample does not significantly moderate the degree of parental psychopathology. This finding was not consistent with the initial hypothesis, in which a higher percentage of co-occurring externalizing behaviour problems in the child sample would be associated with larger effect sizes in terms of the degree of parental psychopathology. In addition, this finding is contrary to the results presented in Table 9, where parents of children with ADHD and co-occurring externalizing disorders have increased odds of parental psychopathology compared to parents of children with ADHD alone. There are a few possible explanations for this finding. First of all, only six of the twenty-one studies included in the moderator analyses provided the percentage of co-occurring externalizing behaviour problems in the child sample. Second, moderator analyses were only conducted on Research Question 13. It is possible that if the moderator analyses were conducted on a different research question, this moderator analyses might have been significant.

ADHD presentation types were also not found to be a significant moderator, which is in accordance with previous research (Faraone et al., 2000; Hudziak et al., 1998; Knopik et al., 2005; Neuman et al., 1999; Sherman et al., 1997; Smalley et al., 2000). That being said, this finding is contrary to the results presented in Tables 12-13, where the relationship between overall child symptoms of inattentiveness and overall parental psychopathology symptoms was higher than the relationship between symptoms of child hyperactivity/impulsivity and parenting psychopathology symptoms. Given that two to three times as many effect sizes were used to

analyze the results presented in Table 12-13 than used in the moderator analyses, it is possible that the results from Table 12-13 are more compelling than the moderator analysis examining ADHD presentation.

Although gender composition of the child sample was not found to be a significant moderator, this finding was expected. That is; given that child gender, as a moderator, was examined based on overall parental psychopathology, gender differences were not expected. It is possible that the gender composition of the child sample would be significant if separate analyses between maternal and paternal psychopathology were to be conducted.

The mean age of the child sample did not significantly moderate the degree of parental psychopathology. Given the findings of Connell and Goodman (2002), it was expected that a curvilinear relationship would emerge, where parents of children in the youngest age group and the oldest age group would demonstrate higher symptoms of parental psychopathology. However, based on visual inspection of the regression scatter plot, this was not the case. First, it is important to note that findings from the Connell and Goodman's study included samples of children with externalizing or internalizing disorders and therefore, may not be generalizable to a sample of children with ADHD alone. Furthermore, researchers have speculated that age effects vary based on the gender of parent and the type of parental psychopathology (Connell & Goodman, 2002; Pleck, 1997). For example, Bailey (1994) proposed that the association between paternal and child psychopathology coincides with the father's involvement in child rearing, where increased involvement is connected to a stronger relationship in terms of symptomatology. On the other hand, assuming stable maternal involvement, the association between maternal and child psychopathology does not appear to increase with age (Bailey, 1994). Furthermore, specific mental disorders, including depression, have been found to be

more sensitive to age effects (Connell & Goodman, 2002). Given that the moderator analyses here were conducted on a combination of various types of both maternal and paternal psychopathology, it is possible that any potential age effects were washed out.

The gender composition of the parent/caregiver sample was expected to moderate the degree of parental psychopathology, where samples composed of a higher percentage of mothers would be associated with a larger effect sizes. This moderator analysis was not found to be significant. The majority of studies included in the moderator analysis consisted of samples with a high percentage of mothers, ranging from 80-100%. Furthermore, twelve of the 19 studies included in the moderator analysis consisted solely of a maternal sample, which limits variability. The mean age of the parent/caregiver sample was also not a significant moderator. The mean age of parents ranged over a span of less than ten years (i.e., from 33 to 42 years old). No notable pattern was detected through visual inspection of the regression scatter plot. The level of education of the parent/caregiver sample was expected to moderate the degree of parental psychopathology; however, this moderator variable was also not found to be significant. The majority of studies included in the moderator analysis consisted of samples with high rates of high school completion, ranging from 90-100%, limiting variability.

The moderator analyses examining family type consisted of the percentage of biological parents and the percentage of parents who were currently married at the time of study. Both moderators were not significant. It is speculated that the moderator analyses examining the influence of a biological status on the degree of psychopathology was not significant given that the five studies that provided the percentage of biological parents consisted of a limited range (i.e., 88-100%). Samples with a lower percentage of married parents (i.e., 40%) and samples with a higher percentage of married parents (i.e., > 90%) had larger effect sizes.

The moderator variable examining the racial background of the child sample was also not significant. If this moderator variable was found to be significant, it may be important to examine cultural differences between reporting styles. Research has demonstrated that individuals of Asian heritage show more moderacy bias and ambivalence on self-report measures (Paulhus & Vazire, 2007). In addition, researchers have noted that white and black parents differ in terms of their perceptions of child behaviour problems, including ADHD symptoms (Hillemeier, Foster, Heinrichs, Heier, & the Conduct Problems Prevention Research Group, 2007). Although it was predicted that studies conducted in North American countries would demonstrate a stronger relationship between parental psychopathology and child ADHD compared to non-North American countries, this prediction was not supported. It is possible that the eligibility criteria of only including reports written in English might have influenced this finding. That is; it is possible that the sample of non-North American countries included in this meta-analysis is not representative of all of the studies conducted worldwide. Overall there appeared to be limited variability in terms of child and parent characteristics and cultural aspects of the studies included in the analysis. That is, the participants included in the studies tended to be middle class, well educated, mothers of white children residing in North America. This is typical in research, especially studies published in English (Henrich et al., 2010).

Finally the year of publication was not found to significantly moderate the degree of parental psychopathology. It was expected that more recent studies would be associated with smaller effect sizes compared to older studies as found by Connell and Goodman (2002). Once again, it is important to emphasize that Connell and Goodman's moderator analysis examined whether the year of publication moderated the degree of parental psychopathology in terms of the association between parental psychopathology and externalizing disorders in general. No

notable pattern was detected through visual inspection of the regression scatter plot, apart from the slight negative slope of the regression line, which might suggest smaller effect sizes for more recent studies. In a sense, the year of publication was used to assess whether diagnostic criteria and standards had changed over the decades. Given that the studies included in this moderator analysis utilized various versions of the DSM, it is important to consider whether the modifications to the diagnostic criteria of various mental disorders influences the association between parental psychopathology and child ADHD. If the year of publication was found to be a significant moderator, it would be imperative to examine the differences between studies in terms of the type of diagnostic manual use (e.g., DSM or ICD) and the version utilized in the study. If the difference in effect sizes were found to be due to the changes in diagnostic criteria, a reanalysis of the data would be necessary. Failure to do so might result in an "apples and oranges" problem (Lipsey & Wilson, 2001).

Strengths and Limitations

A major strength of the present study is that it is the first meta-analysis conducted on parental psychopathology specifically in families of children with ADHD. Although Connell and Goodman's (2002) meta-analysis encompassed families of children with ADHD, the researchers did not separate families of children with ADHD from other externalizing disorders such as ODD and CD. The amalgamation of multiple externalizing disorders did not allow the researchers to examine the specific association between parental psychopathology and child ADHD. The ability to examine ADHD both exclusively and in combination with CD and ODD was one of the strengths of this study. The results of this study demonstrated that parental psychopathology is associated with ADHD as a separate entity from other externalizing disorders. In addition, parental ADHD was not included in Connell and Goodman's meta-

analysis. The present meta-analysis included the prevalence of parental ADHD, which further adds a unique contribution to the literature. Furthermore, this meta-analysis included 83 studies that were not originally included in the Connell and Goodman study. Given that the Connell and Goodman study was published thirteen years ago, this meta-analysis provides an update of the literature. Specifically, 50 of the 86 studies were published or prepared after Connell and Goodman's cut-off date of 2001. Moreover, 33 of the 86 studies were published or prepared up to 2001, but were not included in the Connell and Goodman study. The lack of consistency between the present meta-analysis and the Connell and Goodman study might be due to the fact that Connell and Goodman only used two (PsycINFO and ERIC) of the five computerized databases that were used in this meta-analysis. As well, Connell and Goodman did not include studies that did not provide separate data on mothers and fathers. Rather than excluding those studies altogether, the present study was able to analyze gender composition of the parent sample through moderator analyses. Furthermore, notably only three studies (Cunningham et al., 1988; Lahey et al., 1987; Nigg, 1996) were used in both the present meta-analysis and the Connell and Goodman study, which demonstrates the uniqueness of this study.

Another major advantage of this study is the strength of the search strategy as indicated by the small number of studies identified by the backward and forward reference search and the high inter-rater reliability. That is, after conducting backward and forward references searches on 85 eligible articles, only one additional report was found and deemed eligible. The main purpose of backward and forward reference searches is to locate reports that may have been missed during the initial database searches. Given that only one of 86 eligible studies was missed demonstrates that thoroughness and strength of the search strategy.

Another major strength of this study is the inclusion of both published and unpublished reports. The inclusion of unpublished reports such as dissertations and theses were included in hopes of reducing possible publication bias (Card, 2012; Dickersin, 2005; Dwan et al., 2008; Easterbrook et al., 1991; Egger & Smith, 1998; Moher et al., 2009). That being said, the inclusion of unpublished research can also be a limitation. Unpublished research such as doctoral dissertations and master's theses do not undergo a rigorous peer review process, which is used as a quality check. The results of this study are in part dependent on the quality of the studies included in the meta-analyses. That is; methodological flaws or limitations within each study may influence the results of this study. The majority of the studies included in this meta-analysis relied on self-report measures. Self-report measures can lead to multiple issues, such as socially desirable responding, acquiescent responding, extreme responding, and cultural limitations (Paulhus & Vazire, 2007). Past studies have strongly relied on either self-report or informant reports on symptoms measures, which may overestimate or underestimate symptom severity (Achenbach, Krukowski, Dumenci, & Ivanova, 2005). Another limitation of this study is the inability to fully control for Type I error for both the parent and children's symptom ratings and consequently, their defined diagnosis. Type I error refers to rejecting a null hypothesis when it is true (Moretz & McKay, 2008). Specifically, a Type I error may occur if the scores across various measures indicate that the individual does not have symptoms of psychopathology, when the individual does exhibit symptoms of psychopathology. Multiple informants on measures may be advantageous to reduce acquiescent, extreme responding (Paulhus & Vazire, 2007) and Type I error (Moretz & McKay, 2008). That being said, research demonstrates there is a low agreement between multiple informant ratings (Achenbach et al., 2005). The majority of studies used parent ratings of the child's behaviour. Specifically, the

parent who is also being assessed for a potential mental disorder was usually the same parent who was rating the child's behaviour. This has the potential to be problematic if the parents overestimate or underestimate symptom severity of their child. Research has demonstrated that mothers with mental disorders have a tendency to over-report child disruptive behaviours (Briggs-Gowan, Carter, & Schwab-Stone, 1996; Fergusson, Lynskey, & Horwood, 1993). Studies have also shown that symptoms of maternal depression (Breslau, Davis, & Prabucki, 1988; Fergusson et al., 1993) and anxiety (Briggs-Gowan et al., 1996) are associated with higher rates of reporting errors. It would be ideal for future studies to utilize clinical interviews to investigate the symptoms of various psychopathologies; however, it is not always feasible due to limited resources.

Another limitation of the studies included in this meta-analysis is that it is possible that families with more severe levels of psychopathology symptomatology may be less likely to participate in research. This may lead to a clinical sample of children with ADHD with an underestimation of parental psychopathology. Another limitation is potential attrition at any stage of a study (Wilkinson, 1999). This limitation is more of a concern when working with families with mental disorders (Weiss et al., 2000). It is possible that the families who drop out of any particular study may be different from the participants who stay in the study in terms of sociodemographic variables or severity of psychopathology symptomatology. With regards to threats to external validity, interaction of history and treatment is a concern. Interaction of history and treatment occurs when results obtained may not be generalizable to those found in past research (Creswell, 2013). In this study, the main issue would pertain to the fact that the DSM-IV-TR criteria for certain disorders, such as ADHD, has changed over time. Therefore, the results of some studies used in the meta-analysis may not be comparable to other studies that

utilized ADHD criteria other than the DSM-IV-TR. Furthermore, the symptoms of ADHD and other types of psychopathology in the included studies were not based on the DSM-5 criteria. For example, even though Conners 3 has been updated to provide scores based on the DSM-5 criteria, the ADHD symptoms for most studies that used the Conners measures were based on the DSM-IV-TR criteria. This is largely due to the timing of the release of the DSM-5. Given the delay in the peer review process, the majority of the studies that were published by June 2014 did not use measures based on the DSM-5.

Given the large number of studies included in this meta-analysis, the variance in the quality of the studies included may come into question. One way to scrutinize the results of the present meta-analysis is to compare the overall summary prevalence rates presented in Tables 1-7 with the aggregated prevalence rates found in the studies with strong methodological approaches. One characteristic of strong methodological approaches may be the use of detailed clinical interviews to establish diagnoses in either or both parents and children. The summary prevalence rates presented in Tables 1-7 were comparable to the studies that were deemed to be of high quality based on the use of clinical interviews as assessment measures or a previous diagnosis from a psychologist or psychiatrist (e.g., Merson, 2012; Romirowsky & Chronis-Tuscano, 2013; Schatz, 2012; Stawicki, Nigg, & von Aye, 2006).

Directions for Future Research

Research on ADHD has predominantly focused on the dyadic relationship and interaction between mothers and sons (Johnston, Chen, & Ohan, 2006; Seipp & Johnston, 2005). Only two studies included in this meta-analysis psychopathology focused solely on fathers in families of children with ADHD (Chang et al., 2013; Romirowsky & Chronis-Tuscano, 2013). This trend has emerged for two main reasons: (1) research on family systems has largely focused on

mothers, specifically, well-educated mothers (Chen & Johnston, 2007), and (2) ADHD research has largely focused on males (e.g., Chen & Johnston, 2007; Nigg & Hinshaw, 1998). The latter is due to the higher prevalence of male than female diagnoses of ADHD during childhood (APA, 2013; Kessler et al., 2006). Therefore, there is a dearth of research focused exclusively on fathers and their relation to their children with ADHD, particularly daughters. Furthermore, research on families of children with ADHD has, in general, focused exclusively on the traditional, nuclear family as defined by two married, biological parents and their children. Given the increasing prevalence of separation, divorce, and common-law, in harmony with the rise of married and cohabiting same-sex couples, it is essential for research on this important topic to include different family types that better reflect the modern family.

Clinical Implications and Conclusions

The results of this study provide greater insight into the unique challenges experienced by families of children with ADHD. Researchers now have access to a better understanding of the complex family systems of families of children with ADHD. In addition, the implications of this study support the association between parental psychopathology and childhood ADHD. Furthermore, the results of this study clarified the discrepancies pertaining to this relationship. It is important for clinicians working directly with the families of children with ADHD to be aware of a possible co-occurring psychiatric disorder in the parents. Furthermore, the implications of this study suggest that clinicians working with this population may want to consider incorporating interventions targeted at addressing a parent's psychopathology in addition to focusing on the child's problem behaviour. Clinicians and researchers will benefit from the results of this research by developing a better understanding of impact parental psychopathology may have on treatment outcomes.

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Table 1

Characteristics of Studies Included in Analysis of Prevalence of Overall Psychopathology in Parents of Children with ADHD (Research Question 1)

Study	*N* [a]	Publication type	Country of study	Gender of Parent	Assessment Measures [b]	Prevalence (%)	95% CI	*p*-value
Accardo, Blondis, & Whitman (1990)	415	Journal article	U.S.	Both	BDI	9.60	[7.12, 12.83]	<.001
Agha, Zammit, Thapar, & Langley (2013)	410	Journal article	United Kingdom	Both	DSM-IV Checklist	21.88	[17.98, 26.34]	<.001
Barron (1996)[c]	73	Thesis	U.S.	Both	SCID-NP	1.73	[0.29, 9.64]	<.001
Baumann et al. (2004)[c]	118	Journal article	U.S.	Female	SCID-NP	1.69	[0.42, 6.52]	<.001
Biederman et al. (1991a)	86	Journal article	U.S.	Both	DIS	23.90	[15.77, 34.50]	<.001
Biederman et al. (1991b)	95	Journal article	U.S.	Both	DIS	8.77	[2.34, 27.86]	.001
Bowman (1993)	20	Thesis	U.S.	Both	MCMI-II	7.10	[1.30, 30.72]	.004
Brinkman et al. (2011)	26	Journal article	U.S.	Both	K6	19.20	[8.22, 38.67]	.004
Byrnes (2002)	35	Thesis	U.S.	Female	BDI-II	40.00	[25.32, 56.73]	.240
Cantwell (1972)	100	Journal article	U.S.	Both	Interview	5.10	[0.97, 22.75]	<.001
Chazan et al. (2011)	93	Journal article	Brazil	Both	ASRS; Interview	15.40	[9.28, 24.46]	<.001
Chronis et al. (2003)	30	Journal article	U.S.	Both	SCID-NP	6.70	[1.69, 23.10]	<.001
Chronis-Tuscano et al. (2008)	70	Journal article	U.S.	Female	DSM-IV Checklist	17.00	[9.89, 27.65]	<.001
Cussen et al. (2012)[c]	30	Journal article	Australia	Both	DASS	49.50	[32.35, 66.76]	.956
Foltz (1993)	111	Thesis	U.S.	Both	Previously diagnosed [c]	19.02	[12.69, 27.51]	<.001
Freeman (1999)	36	Thesis	Canada	Both	CES-D	8.41	[2.18, 27.45]	.001
Freitag et al. (2012)	275	Journal article	Germany	Both	ADHS-SB	11.64	[8.35, 16.00]	<.001
Gau (2001)	27	Thesis	U.S.	Both	SADS	20.12	[7.83, 42.73]	.013

Goldstein (2006)	34	Thesis	U.S.	Both	SCID	3.49	[0.37, 26.00]	.004
Harvey, Danforth, McKee, Ulaszek, & Friedman (2003)	46	Journal article	U.S.	Female	ADDES	26.09	[15.45, 40.54]	.002
Jans et al. (2013)	143	Journal article	Germany	Both	ADHS-DC; SCID	11.33	[6.25, 19.68]	<.001
Jurek (1998)	47	Thesis	U.S.	Female	BDI-II	21.28	[11.85, 35.21]	<.001
Kepley & Ostrander (2007)	52	Journal article	U.S.	Both	SCID	22.61	[12.09, 38.28]	.001
Lahey et al. (1987)	18	Journal article	U.S.	Both	SADS	6.08	[0.77, 35.20]	.012
Margari et al. (2013)	41	Journal article	Italy	Both	SCID	9.78	[2.10, 35.46]	.007
McCormick (1995)	39	Journal article	U.S.	Female	Interview; Zung SDS	38.46	[24.69, 54.36]	.153
McGough et al. (2005)	218	Journal article	U.S.	Both	ADHD RS-IV	26.22	[20.69, 32.62]	<.001
Merson (2012)	293	Thesis	U.S.	Both	Previously diagnosed[d]	19.79	[15.62, 24.75]	<.001
Milberger, Biederman, Faraone, & Jones (1998)	32	Journal article	U.S.	Both	SCID	30.67	[17.14, 48.62]	.035
Morrison & Stewart (1971)	109	Journal article	U.S.	Both	Interview	6.95	[1.53, 26.37]	.001
Morrison (1980)[c]	138	Journal article	U.S.	Both	Interview	2.94	[0.70, 11.43]	<.001
Nigg (1996)	24	Thesis	U.S.	Both	DIS-3-R	7.44	[1.19, 34.96]	.009
Pfiffner et al. (1999)	74	Journal article	U.S.	Both	SCID	22.10	[13.92, 33.24]	<.001
Pfiffner & McBurnett (2006)	76	Journal article	U.S.	Both	SCID	10.23	[5.09, 19.50]	<.001
Pheula et al. (2011)	100	Journal article	Brazil	Both	K-SADS-E	28.00	[20.09, 37.57]	<.001
Romirowsky & Chronis-Tuscano (2013)	37	Journal article	U.S.	Both	MINI	13.50	[5.73, 28.61]	<.001
Salvato (2000)	45	Thesis	U.S.	Female	BDI-II	13.30	[6.09, 26.61]	<.001
Schatz (2009)	24	Thesis	U.S.	Female	Interview	10.70	[3.08, 31.16]	.002
Schatz (2012)	38	Thesis	U.S.	Female	SCID-CV	18.00	[8.75, 33.43]	<.001
Segenreich et al. (2009)	15	Journal article	Brazil	Both	ASRS	33.33	[14.3, 59.90]	0.214
Shay (2009)	111	Thesis	U.S.	Female	BDI-II	8.18	[4.32, 14.96]	<.001

Stawicki et al. (2006)	204	Journal article	U.S.	Both	DIS	17.65	[13.01, 23.50]	<.001
Steinhausen et al. (2013)	140	Journal article	Germany	Both	German ADHD-SR	10.88	[6.37, 17.97]	<.001
Takeda et al. (2010)	323	Journal article	U.S.	Both	ASRS	24.90	[20.48, 29.91]	<.001
Takeda, Ambrosini, deBerardinis, & Elia (2012)	96	Journal article	U.S.	Both	ASRS	25.60	[18.40, 34.42]	<.001
Tang (2008)	26	Thesis	U.S.	Both	BAI; CES-D	10.20	[2.46, 33.90]	.005
Walker (1999)[c]	77	Thesis	U.S.	Both	ADQ-R	50.05	[39.05, 61.05]	.993
West, Houghton, Douglas, Wall, & Whiting (1999)	80	Journal article	Australia	Female	BDI	10.29	[4.86, 20.49]	<.001
Zisser & Eyberg (2012)	54	Journal article	U.S.	Female	Interview	11.00	[5.01, 22.47]	<.001

	Q	Prevalence (%)	95% CI	*p*-value
Summary Effect	214.17(48)	16.96	[14.37, 19.91]	<.001
Trimmed Summary Effect	130.60(43)	17.32	[15.03, 19.88]	<.001

[a] Total number of events across all types of mental disorders including both fathers and mothers
[b] Assessment tool(s) used to measure parental psychopathology.
[c] Study was identified as a potential outlier and was not included in the Trimmed Summary Effect.
[d] Diagnosed by a psychologist or psychiatrist outside of the study.

Note. ADDES = Adult Attention Deficit Disorders Evaluation Scale; ADHD RS-IV = Adult ADHD Rating Scale IV; ADHS-DC = German diagnostic checklist for diagnosis of ADHD in adults; ADHS-SB = German self-rating instrument for ADHD symptoms in adulthood; ADQ-R = Attention Deficit Questionnaire-Revised; ASRS = Adult Self-Report Scale; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory II; CES-D = Center for Epidemiologic Studies Depression Scale; DASS = Depression Anxiety Stress Scale; DIS = National Institute of Mental Health (NIMH) Diagnostic Interview Schedule; DIS-3-R = NIMH Interview Schedule for DSM-III-R; German ADHD-SR = German ADHD-Self-Rating Scale; Interview = Study clinician interview; K6 = Kessler Psychological Distress Scale (K6); K-SADS-E = Kiddie-Schedule for Affective Disorders and Schizophrenia; MCMI-II = Millon Clinical Multiaxial Inventory-II; MINI = Mini International Neuropsychiatric Interview; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM; SCID-CV = Structured Clinical Interview for DSM Disorders – Clinician Version; SCID-NP = Structured Clinical Interview for DSM Non-Patient Edition; Zung SDS = Zung Self-rating Depression Scales (SDS).

Table 2

Characteristics of Studies Included in Analysis of Prevalence of ADHD in Parents of Children with ADHD (Research Question 2)

Study	*N*	Publication type	Country of study	Gender of Parent	Assessment Measures [a]	Prevalence (%)	95% CI	*p*-value
Agha et al. (2013)	410	Journal article	United Kingdom	Both	DSM-IV Checklist	21.88	[17.98, 26.34]	<.001
Biederman et al. (1991b)	95	Journal article	U.S.	Both	DIS	34.40	[25.56, 44.47]	.003
Cantwell (1972)	100	Journal article	U.S.	Both	Interview	8.18	[2.79, 21.69]	<.001
Chazan et al. (2011)	93	Journal article	Brazil	Both	ASRS; Interview	15.40	[9.28, 24.46]	<.001
Chronis-Tuscano et al. (2008)	70	Journal article	U.S.	Female	DSM-IV Checklist	17.00	[9.89, 27.65]	<.001
Foltz (1993)	111	Thesis	U.S.	Both	Previously diagnosed [c]	19.02	[12.69, 27.51]	<.001
Freeman (1999)	35	Thesis	Canada	Both	Previously diagnosed [c]	12.24	[4.17, 30.87]	.001
Freitag et al. (2012)	275	Journal article	Germany	Both	ADHS-SB	11.64	[8.35,16.00]	<.001
Harvey et al. (2003)	46	Journal article	U.S.	Female	ADDES	26.09	[15.45, 40.54]	.002
Jans et al. (2013)	143	Journal article	Germany	Female	ADHS-DC	29.20	[21.17, 38.79]	<.001
Kepley & Ostrander (2007)	54	Journal article	U.S.	Female	SCID	18.52	[10.27, 31.11]	<.001
McGough et al. (2005)	218	Journal article	U.S.	Both	ADHD RS-IV	26.22	[20.69, 32.62]	<.001
Merson (2012)	293	Thesis	U.S.	Both	Previously diagnosed [c]	19.79	[15.62, 24.75]	<.001
Milberger et al. (1998)	32	Journal article	U.S.	Both	SCID	30.67	[17.14, 48.62]	.035
Pheula et al. (2011)	100	Journal article	Brazil	Female	K-SADS-E	28.00	[20.09, 37.57]	<.001
Romirowsky & Chronis-Tuscano (2013)	37	Journal article	U.S.	Male	MINI	13.50	[5.73, 28.61]	.001
Schatz (2009)	24	Thesis	U.S.	Female	Interview	10.70	[3.08, 31.16]	.002

Segenreich et al. (2009)	15	Journal article	Brazil	Both	ASRS	33.30	[14.3, 59.9]	.214
Stawicki et al. (2006)	204	Journal article	U.S.	Both	DIS	17.65	[13.01, 23.50]	<.001
Steinhausen et al. (2013)	140	Journal article	Germany	Both	German ADHD-SR	10.88	[6.37, 17.97]	<.001
Takeda et al. (2010)	323	Journal article	U.S.	Both	ASRS	24.90	[20.48, 29.91]	<.001
Takeda et al. (2012)	116	Journal article	U.S.	Both	ASRS	25.60	[18.40, 34.42]	<.001
Walker (1999)[b]	77	Thesis	U.S.	Both	ADQ-R	50.05	[39.05, 61.05]	.993
Zisser & Eyberg (2012)	54	Journal article	U.S.	Female	Interview	11.00	[5.01, 22.47]	<.001

	Q	Prevalence (%)	95% CI	*p*-value
Summary Effect	95.02(23)	21.26	[18.07, 24.85]	<.001
Trimmed Summary Effect	63.82(22)	20.41	[17.70, 23.41]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.
[b] Study was identified as a potential outlier and was not included in the Trimmed Summary Effect.
[c] Diagnosed by a psychologist or psychiatrist outside of the study.

Note. ADDES = Adult Attention Deficit Disorders Evaluation Scale; ADHD RS-IV = Adult ADHD Rating Scale IV; ADHS-DC = German diagnostic checklist for diagnosis of ADHD in adults; ADHS-SB = German self-rating instrument for ADHD symptoms in adulthood; ADQ-R = Attention Deficit Questionnaire-Revised; ASRS = Adult Self-Report Scale; DIS = National Institute of Mental Health (NIMH) Diagnostic Interview Schedule; German ADHD-SR = German ADHD-Self-Rating Scale; Interview = Study clinician interview; K-SADS-E = Kiddie-Schedule for Affective Disorders and Schizophrenia; MINI = Mini International Neuropsychiatric Interview; SCID = Structured Clinical Interview for DSM.

Table 3

Characteristics of Studies Included in Analysis of Prevalence of Depressive Disorders in Parents of Children with ADHD (Research Question 3)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Prevalence (%)	95% CI	*p*-value
Accardo et al. (1990)	415	Journal article	U.S.	Both	BDI	9.60	[7.12, 12.83]	<.001
Baumann et al. (2004)[b]	118	Journal article	U.S.	Female	SCID-NP	1.69	[0.42, 6.52]	<.001
Biederman et al. (1991b)	95	Journal article	U.S.	Both	DIS	22.10	[14.87, 31.54]	<.001
Byrnes (2002)	35	Thesis	U.S.	Female	BDI-II	40.00	[25.32, 56.73]	.240
Cantwell (1972)	100	Journal article	U.S.	Both	Interview	4.04	[0.86, 16.91]	<.001
Cussen et al. (2012)[b]	30	Journal article	Australia	Both	DASS	53.00	[35.51,69.79]	.743
Freeman (1999)	39	Thesis	Canada	Female	Previously diagnosed [c]	2.56	[0.36, 16.08]	<.001
Goldstein (2006)	26	Thesis	U.S.	Both	SCID	3.87	[0.43, 27.12]	.005
Jans et al. (2013)	143	Journal article	Germany	Female	SCID	9.10	[5.36, 15.04]	<.001
Jurek (1998)	47	Thesis	U.S.	Female	BDI-II	21.28	[11.85, 35.21]	<.001
Kepley & Ostrander (2007)	50	Journal article	U.S.	Female	SCID	38.00	[25.72, 52.04]	.093
Lahey et al. (1987)	18	Journal article	U.S.	Both	SADS	15.88	[4.88, 41.00]	..012
Margari et al. (2013)	41	Journal article	Italy	Both	SCID	32.34	[18.53, 50.11]	.051
McCormick (1995)	39	Journal article	U.S.	Female	Interview; Zung SDS	38.46	[24.69, 54.36]	.153
Morrison & Stewart (1971)	100	Journal article	U.S.	Both	Interview	19.41	[11.13, 31.68]	<.001
Nigg (1996)	24	Thesis	U.S.	Both	DIS-3-R	12.70	[3.87, 34.43]	.003
Pfiffner et al. (1999)	74	Journal article	U.S.	Both	SCID	18.81	[11.34, 29.56]	<.001
Salvato (2000)	45	Thesis	U.S.	Female	BDI-II	13.30	[6.09, 26.61]	<.001
Schatz (2012)	38	Thesis	U.S.	Female	SCID-CV	18.00	[8.75, 33.43]	<.001
Shay (2009)	111	Thesis	U.S.	Female	BDI-II	8.18	[4.32, 14.96]	<.001

Tang (2008)	26	Thesis	U.S.	Both	CES-D	30.80	[16.22, 50.58]	.057
West et al. (1999)	80	Journal article	Australia	Female	BDI	10.29	[4.86, 20.49]	<.001

	Q	Prevalence (%)	95% CI	*p*-value
Summary Effect	121.59(21)	17.09	[12.33, 23.20]	<.001
Trimmed Summary Effect	88.46(19)	17.32	[12.80, 23.00]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.
[b] Study was identified as a potential outlier and was not included in the Trimmed Summary Effect.
[c] Diagnosed by psychologist or psychiatrist outside of the study.

Note. BDI = Beck Depression Inventory; BDI-II= Beck Depression Inventory II; CES-D = Center for Epidemiologic Studies Depression Scale; DASS = Depression Anxiety Stress Scale; DIS = National Institute of Mental Health (NIMH) Diagnostic Interview Schedule; DIS-3-R = NIMH Interview Schedule for DSM-III-R; Interview = Study clinician interview; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM; SCID-CV = Structured Clinical Interview for DSM Disorders – Clinician Version; SCID-NP = Structured Clinical Interview for DSM Non-Patient Edition; Zung SDS = Zung Self-rating Depression Scales (SDS).

Table 4

Characteristics of Studies Included in Analysis of Prevalence of Bipolar and Related Disorders in Parents of Children with ADHD (Research Question 4)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Prevalence (%)	95% CI	*p*-value
Biederman et al. (1991b)	95	Journal article	U.S.	Both	DIS	1.30	[0.16, 9.92]	<.001
Cantwell (1972)	100	Journal article	U.S.	Both	Interview	1.40	[0.13, 13.74]	.001
Kepley & Ostrander (2007)	52	Journal article	U.S.	Both	SCID	5.77	[1.87, 16.42]	<.001
Lahey et al. (1987)	18	Journal article	U.S.	Both	SADS	3.85	[0.35, 31.52]	.010
Morrison & Stewart (1971)	118	Journal article	U.S.	Both	Interview	2.08	[1.48, 7.10]	<.001
					Q	Prevalence (%)	95% CI	*p*-value
Summary Effect					2.45(4)	3.28	[1.48, 7.10]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.

Note. DIS = National Institute of Mental Health (NIMH) Diagnostic Interview Schedule; Interview = Study clinician interview; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM.

Table 5

Characteristics of Studies Included in Analysis of Prevalence of Anxiety Disorders in Parents of Children with ADHD (Research Question 5)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Prevalence (%)	95% CI	*p*-value
Barron (1996)[b]	73	Thesis	U.S.	Female	SCID-NP	1.37	[0.19, 9.09]	<.001
Biederman et al. (1991a)	86	Journal article	U.S.	Both	DIS	23.90	[15.77, 34.50]	<.001
Chronis et al. (2003)	30	Journal article	U.S.	Female	SCID-NP	6.70	[1.69, 23.10]	<.001
Cussen et al. (2012)	30	Journal article	Australia	Both	DASS	46.00	[29.35, 63.59]	.662
Gau (2001)	27	Thesis	U.S.	Female	SADS	40.70	[24.16, 59.66]	.337
Goldstein (2006)	29	Thesis	U.S.	Both	SCID	2.05	[0.15, 22.38]	.004
Jans et al. (2013)	143	Journal article	Germany	Female	SCID	5.34	[2.49, 11.08]	<.001
Kepley & Ostrander (2007)	51	Journal article	U.S.	Female	SCID	31.37	[20.19, 45.23]	.009
Lahey et al. (1987)	18	Journal article	U.S.	Female	SADS	16.70	[5.49, 40.89]	.011
Margari et al. (2013)	41	Journal article	Italy	Both	SCID	25.14	[13.25, 42.49]	.007
Nigg (1996)	24	Thesis	U.S.	Both	DIS-3-R	8.88	[1.92, 32.66]	.004
Pfiffner et al. (1999)	74	Journal article	U.S.	Both	SCID	25.79	[17.00,37.08]	<.001
Pfiffner & McBurnett (2006)	76	Journal article	U.S.	Both	SCID	10.23	[5.09, 19.50]	<.001
Tang (2008)	26	Thesis	U.S.	Both	BAI	5.43	[0.99, 24.82]	.001
					Q	Prevalence (%)	95% CI	*p*-value
Summary Effect					60.76(13)	16.07	[10.24, 24.32]	<.001
Trimmed Summary Effect					51.91(12)	17.92	[11.73, 26.42]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.
[b] Study was identified as a potential outlier and was not included in the Trimmed Summary Effect.

Note. BAI = Beck Anxiety Inventory; DASS = Depression Anxiety Stress Scale; DIS = National Institute of Mental Health (NIMH) Diagnostic Interview Schedule; DIS-3-R = NIMH Interview Schedule for DSM-III-R; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM; SCID-NP = Structured Clinical Interview for DSM Non-Patient Edition.

Table 6

Characteristics of Studies Included in Analysis of Prevalence of Substance-Related and Addictive Disorders in Parents of Children with ADHD (Research Question 6)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Prevalence (%)	95% CI	*p*-value
Cantwell (1972)	50	Journal thesis	U.S.	Both	Interview	16.18	[7.70, 30.89]	<.001
Gau (2001)	27	Thesis	U.S.	Female	SADS	21.31	[8.95, 42.72]	.011
Goldstein (2006)	46	Thesis	U.S.	Both	SCID	14.30	[4.69, 36.15]	.004
Kepley & Ostrander (2007)	51	Journal article	U.S.	Female	SCID	35.29	[23.49, 49.20]	.039
Lahey et al. (1987)	18	Journal article	U.S.	Both	SADS	4.65	[0.52, 31.32]	.008
Margari et al. (2013)	37	Journal article	Italy	Both	SCID	6.87	[0.93, 36.68]	.013
Morrison & Stewart (1971)	59	Journal article	U.S.	Both	Interview	17.89	[9.32, 31.60]	<.001
Morrison (1980)	138	Journal article	U.S.	Both	Interview	4.45	[1.34, 13.72]	<.001
Nigg (1996)	24	Thesis	U.S.	Both	DIS-3-R	2.10	[0.13, 26.07]	.007
					Q	Prevalence (%)	95% CI	*p*-value
Summary Effect					21.48(8)	14.18	[8.18, 23.45]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.

Note. DIS-3-R = NIMH Interview Schedule for DSM-III-R; Interview = Study clinician interview; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM.

Table 7

Characteristics of Studies Included in Analysis of Prevalence of Antisocial Personality Disorder in Parents of Children with ADHD (Research Question 8)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Prevalence (%)	95% CI	*p*-value
Bowman (1993)	20	Thesis	U.S.	Female	MCMI-II	10.00	[2.51, 32.38]	.003
Cantwell (1972)	100	Journal article	U.S.	Both	Interview	4.16	[0.56, 25.05]	.003
Lahey et al. (1987)	18	Journal article	U.S.	Both	SADS	3.85	[0.35, 31.52]	.010
Margari et al. (2013)	42	Journal article	Italy	Both	SCID	1.71	[0.15, 16.43]	.001
Morrison & Stewart (1971)	59	Journal article	U.S.	Both	Interview	2.71	[0.35, 18.13]	.001
Morrison (1980)	138	Journal article	U.S.	Both	Interview	2.68	[0.77, 8.91]	<.001
Nigg (1996)	47	Thesis	U.S.	Both	DIS-3-R	12.07	[2.85, 39.10]	.012
					Q	Prevalence (%)	95% CI	*p*-value
Summary Effect					4.72(6)	4.84	[2.57, 8.93]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.

Note. DIS-3-R = NIMH Interview Schedule for DSM-III-R; Interview = Study clinician interview; MCMI-II = Millon Clinical Multiaxial Inventory-II; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM.

Table 8

Characteristics of Studies Included in Analysis of Odds Ratios of Parents of Children with ADHD Having a Psychopathology Compared Parents of Children without ADHD (Research Question 10)

Study	ADHD *N*	Control *N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	*Odds Ratio*	95% CI	*p*-value
Accardo et al. (1990)	415	187	Journal article	U.S.	Both	BDI	1.32	[0.70, 2.49]	.394
Biederman et al. (1991b)	95	52	Journal article	U.S.	Both	DIS	6.57	[0.96, 45.25]	.056
Bowman (1993)	20	20	Thesis	U.S.	Female	MCMI-II	4.18	[0.17, 100.66]	.378
Cantwell (1972)	100	100	Journal article	U.S.	Both	Interview	2.95	[0.31, 27.64]	.344
Chronis et al. (2003)	30	116	Journal article	U.S.	Both	SCID-NP	0.82	[0.15, 4.36]	.812
Cussen et al. (2012)	30	156	Journal article	Australia	Both	DASS	6.27	[2.68, 14.67]	<.001
Gau (2001)	27	165	Thesis	U.S.	Female	SADS	0.94	[0.21, 4.26]	.933
Goldstein (2006)	31	60	Thesis	U.S.	Both	SCID	2.05	[0.11, 39.16]	.634
Kepley & Ostrander (2007)	54	61	Journal article	U.S.	Female	SCID	2.54	[0.49, 13.07]	.264
Lahey et al. (1987)	18	39	Journal article	U.S.	Both	SADS	1.00	[0.07, 13.61]	.998
Margari et al. (2013)	83	23	Journal article	Italy	Both	BADDS; SCID	3.05	[0.42, 22.05]	.269
Morrison & Stewart (1971)	59	156	Journal article	U.S.	Both	Interview	1.81	[0.26, 12.54]	.547
Morrison (1980)	140	90	Journal article	U.S.	Both	Interview	1.04	[0.12, 9.12]	.972
Nigg (1996)	29	46	Thesis	U.S.	Both	DIS-3-R	0.94	[0.08, 10.81]	.961
Pheula et al. (2011)	100	100	Journal article	Brazil	Female	K-SADS-E	12.57	[3.68, 42.98]	<.001
Schatz (2012)	38	28	Thesis	U.S.	Female	ADHD RS-IV; BAI; BDI	13.57	[0.74, 248.43]	.079
Stawicki et al. (2006)	204	131	Journal article	U.S.	Both	DIS	6.80	[2.36, 19.61]	<.001

Tang (2008)	26	27	Thesis	U.S.	Both	BAI; CES-D	2.92	[0.24, 35.56]	.401
						Q	*Odds Ratio*	95% CI	*p*-value
Summary Effect						25.76(17)	2.85	[1.77, 4.59]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.

Note. ADHD RS-IV = Adult ADHD Rating Scale IV; BADDS = Brown Attention Deficit Disorder Scales; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; CES-D = Center for Epidemiologic Studies Depression Scale; DASS = Depression Anxiety Stress Scale; DIS = National Institute of Mental Health (NIMH) Diagnostic Interview Schedule; DIS-3-R = NIMH Interview Schedule for DSM-III-R; Interview = Study clinician interview; K-SADS-E = Kiddie-Schedule for Affective Disorders and Schizophrenia; MCMI-II = Millon Clinical Multiaxial Inventory-II; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM; SCID-NP = Structured Clinical Interview for DSM Non-Patient Edition.

Table 9

Characteristics of Studies Comparing the Odds of Psychopathology Symptomatology of Parents of Children with ADHD and with Co-occurring Externalizing Disorders (Research Question 11)

Study	ADHD *N*	Control *N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	*Odds Ratio*	95% CI	*p*-value
Bowman (1993)	20	20	Thesis	U.S.	Female	MCMI-II	3.27	[0.41, 25.94]	.262
Chronis et al. (2003)	116	30	Journal article	U.S.	Female	SCID-NP	1.62	[0.13, 8.32]	.565
Goldstein (2006)	93	31	Thesis	U.S.	Both	SCID	1.61	[0.13, 20.79]	.713
Lahey et al. (1987)	23	18	Journal article	U.S.	Both	SADS	1.93	[0.16, 23.78]	.606
						Q	*Odds Ratio*	95% CI	*p*-value
Summary Effect						0.31(3)	1.99	[0.70, 5.66]	.195

[a] Assessment tool(s) used to measure parental psychopathology.

Note. MCMI-II = Millon Clinical Multiaxial Inventory-II; SADS = Schedule for Affective Disorders and Schizophrenia; SCID = Structured Clinical Interview for DSM; SCID-NP = Structured Clinical Interview for DSM Non-Patient Edition.

Table 10

Characteristics of Studies Comparing the Mean Level of Psychopathology Symptomatology of Parents of Children with and without ADHD (Research Question 12)

Study	ADHD *N*	Control *N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	*d*	95% CI	*p*-value
Anderson, Hinshaw, & Simmel (1994)	49	37	Journal article	U.S.	Female	SCL-90-R	0.24	[-0.19, 0.66]	.279
Baumann (1999)	52	120	Thesis	U.S.	Female	BDI	0.07	[-0.25, 0.40]	.662
Beck et al. (1990)	10	10	Journal article	U.S.	Female	PSI	1.28	[0.32, 2.24]	.009
Befera & Barkley (1985)[b]	30	30	Journal article	U.S.	Female	BDI	1.25	[0.69, 1.80]	<.001
Bowman (1993)	20	20	Thesis	U.S.	Female	MCMI-II	0.43	[-0.20, 1.06]	.177
Chang et al. (2013)[b]	286	223	Journal article	Taiwan	Male	ASRS; CES-D	0.04	[-0.14, 0.21]	.685
Chronis et al. (2003)	30	116	Journal article	U.S.	Both	BDI; MAST-S	0.16	[-0.24, 0.56]	.434
Cunningham et al. (1988)	26	26	Journal article	Canada	Both	BDI	0.48	[-0.08, 1.04]	.091
DeWolfe (1998)	25	25	Thesis	Canada	Both	PSI	0.44	[-0.12, 1.00]	.124
Drabick et al. (2004)	19	511	Journal article	Ukraine	Female	SCL-90-R	0.00	[-0.46, 0.46]	1.000
Epstein et al. (2000)	561	325	Journal article	U.S.	Both	CAARS	0.29	[0.15, 0.43]	<.001
Gau & Chang (2013)	190	223	Journal article	U.S.	Female	ASRS; CES-D	0.24	[0.04, 0.43]	.016
Gau (2007)	375	750	Thesis	Taiwan	Female	CHQ	0.51	[0.38, 0.64]	<.001
Goldstein (2006)	28	38	Thesis	U.S.	Both	ADHD RS-IV; SCID	0.30	[-0.20, 0.79]	.247
Jacobvitz (1988)	27	27	Thesis	U.S.	Female	IPAT	0.37	[-0.17, 0.90]	.183
Johnston (1996)	21	31	Journal article	Canada	Both	SCL-90-R	0.58	[0.01, 1.15]	.045
Kepley & Ostrander (2007)	79	102	Journal article	U.S.	Female	SCID	0.66	[0.36, 0.96]	<.001
Little (1998) - Study 1	27	69	Thesis	Canada	Both	CES-D	0.27	[-0.17, 0.72]	.233
Little (1998) - Study 2	19	21	Thesis	Canada	Both	CES-D	0.02	[-0.60, 0.64]	.940
Luedeman (2012)	275	220	Thesis	Canada	Both	ASR	0.33	[0.19, 0.48]	<.001

Macek, Gosar, & Tomori, (2012)	30	37	Journal article	Slovenia	Both	DSM-IV Checklist	0.49	[0.00, 0.98]	.049
Margari et al. (2013)	83	76	Journal article	Italy	Both	BADDS	0.49	[0.17, 0.80]	.002
Milberger, Faraone, Biederman, Testa, & Tsuang (1996)	124	106	Journal article	U.S.	Both	SCID	0.41	[0.15, 0.68]	.002
Miller (2008)	209	185	Thesis	U.S.	Both	CAARS-S:L; SCL-90-R	0.31	[0.11, 0.51]	.003
Norvilitis (1997)	40	28	Thesis	U.S.	Both	CPRS	0.09	[-0.39, 0.57]	.716
Salamone (1993)	25	25	Thesis	U.S.	Female	SCL-90-R	0.56	[-0.01, 1.13]	.041
Satake et al. (2004)	12	14	Journal article	Japan	Both	GHQ	0.65	[-0.14, 1.45]	.107
Schatz (2012)	39	29	Thesis	U.S.	Female	ADHD RS-IV; BAI; BDI	0.92	[0.42, 1.43]	<.001
Shaw et al. (2005)	42	160	Journal article	U.S.	Female	BDI	0.64	[0.29, 0.98]	<.001
Shelton et al. (1998)	116	47	Journal article	U.S.	Female	SCL-90-R	0.61	[0.27, 0.96]	.001
Şimşek, Gökçen, & Fettahoğlu. (2012)	32	33	Journal article	Turkey	Both	ADHD-A; SCL-90-R	0.66	[0.16, 1.12]	.010
Tang (2008)	26	27	Thesis	U.S.	Both	BAI; CES-D	0.53	[-0.02, 1.08]	.060
						Q	*d*	95% CI	*p*-value
Summary Effect						61.87(31)	0.39	[0.31, 0.48]	<.001
Trimmed Summary Effect						38.01(29)	0.39	[0.32, 0.46]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.
[b] Study was identified as a potential outlier and was not included in the Trimmed Summary Effect.

Note. ADHD-A = Adult Attention-Deficit Hyperactivity Scale; ADHD RS-IV = Adult ADHD Rating Scale IV; ASR = Adult Self-Report; BAI ASRS = Adult Self-Report Scale; BADDS = Brown Attention Deficit Disorder Scales; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; CAARS = Conners' Adult ADHD Rating Scale-Self Report; CAARS-S:L = Conners' Adult ADHD Rating Scale-Self Report: Long Version; CES-D = Center for Epidemiologic Studies Depression Scale; CHQ = Chinese Health Questionnaire; CPRS = Conner's Parent Rating Scale's ADHD subscales; GHQ = General Health Questionnaire; IPAT = IPAT Anxiety Scale; MAST-S = Michigan Alcohol Screening Test, Short Form; MCMI-II = Millon Clinical Multiaxial Inventory-II; PSI = Parenting Stress Index; SCID = Structured Clinical Interview for DSM; SCL-90-R = Symptom Checklist-90-Revised.

Table 11

Characteristics of Studies Included in Analysis of the Degree of Association Between Child's Overall Symptoms of ADHD and Parental Psychopathology Symptomatology (Research Question 13)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Correlation	95% CI	*p*-value
Baumann et al. (2004)	118	Journal article	U.S.	Female	BDI	0.13	[-0.05, 0.30]	.161
Byrnes (2002)	35	Thesis	U.S.	Female	BDI-II	0.21	[-0.13, 0.51]	.233
Chronis et al. (2007)	108	Journal article	U.S.	Female	SCID-NP	0.01	[-0.18, 0.20]	.233
Foltz (1993)	111	Thesis	U.S.	Both	PSI; SCL-90-R	0.27	[0.09, 0.44]	.004
Gamble (2005)	50	Thesis	U.S.	Both	BDI	0.35	[0.08, 0.57]	.012
Harrison & Sofronoff (2002)	100	Journal article	Australia	Female	BDI	0.08	[-0.12, 0.27]	.430
Kashdan et al. (2004)	45	Journal article	U.S.	Both	BDI; STAI	0.11	[-0.19, 0.39]	.473
Leibowtiz (2013)	107	Thesis	U.S.	Female	DASS-21	0.15	[-0.04, 0.33]	.114
Mendelson (2012)	28	Thesis	U.S.	Female	ADHS RS-IV; SCL-90-R	0.28	[-0.10, 0.59]	.143
O'Rourke (2011)	16.5[c]	Thesis	U.S.	Both	BAI; BDI; CAARS	0.14	[-0.56, 0.73]	.716
Patterson (2006)[b]	50	Thesis	U.S.	Female	CAARS-L:V	0.50	[0.25, 0.68]	<.001
Rashap (1998)	79	Thesis	U.S.	Female	SCL-90-R	0.11	[-0.12, 0.32]	.347
Richards et al. (2014)	385	Journal article	Netherlands	Female	CAARS-S:S, GHQ	0.16	[0.06, 0.26]	.002
Salamone (1993)	25	Thesis	U.S.	Female	SCL-90-R	0.51	[0.15, 0.76]	.008
Salvato (2000)[b]	45	Thesis	U.S.	Female	BDI-II	0.48	[0.22, 0.68]	.001
Schatz (2009)	24	Thesis	U.S.	Female	ADHD RS-IV; BAI; BDI	0.22	[-0.20, 0.57]	.299
Shay (2009)	111	Thesis	U.S.	Female	BDI-II; IDAS	0.30	[0.12, 0.46]	.002
Theule (2010)	50	Thesis	Canada	Both	CAARS	0.20	[-0.10, 0.47]	.184

van der Oord, Prins, Oosterlaan, & Emmelkamp (2006)	65	Journal article	U.S.	Both	CES-D	0.31	[0.07, 0.52]	.011
Vitanza & Guarnaccia (1999)	103	Journal article	U.S.	Female	HSCL	0.16	[-0.03, 0.34]	.107
Zisser & Eyberg (2012)	54	Journal article	U.S.	Female	ASR; CAARS	0.17	[-0.10, 0.42]	.226
					Q	Correlation	95% CI	*p*-value
Summary Effect					25.03(20)	0.21	[0.15, 0.26]	<.001
Trimmed Summary Effect					14.44(18)	0.18	[0.13, 0.23]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.
[b] Study was identified as a potential outlier and was not included in the Trimmed Summary Effect.
[c] Sample size ranged from $N = 7$ to $N = 28$ depending on the symptoms analyzed.

Note. ADHD RS-IV = Adult ADHD Rating Scale IV; ASR = Adult Self-Report; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; BDI-II= Beck Depression Inventory II; CAARS = Conners' Adult ADHD Rating Scale-Self Report; CAARS-S:S = Conners' Adult ADHD Rating Scale-Self Report: Short Version; CAARS-S:L = Conners' Adult ADHD Rating Scale-Self Report: Long Version; CES-D = Center for Epidemiologic Studies Depression Scale; CPRS = Conner's Parent Rating Scale's ADHD subscales; DASS-21 = Depression Anxiety Stress Scales-21; GHQ = General Health Questionnaire; HSCL = Hopkins Symptoms Checklist; IDAS = Inventory of Depression and Anxiety Symptoms; SCID = Structured Clinical Interview for DSM; SCID-NP = Structured Clinical Interview for DSM Non-Patient Edition; SCL-90-R = Symptom Checklist-90-Revised; STAI = State-Trait Anxiety Inventory.

Table 12

Characteristics of Studies Included in Analysis of the Degree of Association Between Child's Symptoms of Inattentiveness and Parental Psychopathology Symptomatology (Research Question 14)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Correlation	95% CI	*p*-value
Foltz (1993)	111	Thesis	U.S.	Both	PSI; SCL-90-R	0.27	[0.09, 0.44]	.004
Gamble (2005)	50	Thesis	U.S.	Both	BDI	0.35	[0.08, 0.57]	.012
Leibowtiz (2013)	107	Thesis	U.S.	Female	DASS-21	0.29	[0.10, 0.45]	.003
Mendelson (2012)	28	Thesis	U.S.	Female	ADHS RS-IV; SCL-90-R	0.24	[-0.15, 0.56]	.221
O'Rourke (2011)	16.5[b]	Thesis	U.S.	Both	BAI; BDI; CAARS	0.13	[-0.57, 0.72]	.739
Patterson (2006)	500	Thesis	U.S.	Female	CAARS-S:L	0.48	[0.48, 0.55]	.000
Rashap (1998)	79	Thesis	U.S.	Female	SCL-90-R	0.06	[-0.17, 0.27]	.631
Salamone (1993)	25	Thesis	U.S.	Female	SCL-90-R	0.51	[0.15, 0.76]	.008
Salvato (2000)	45	Thesis	U.S.	Female	BDI-II	0.45	[0.18, 0.66]	.002
Schatz (2009)	24	Thesis	U.S.	Female	ADHD RS-IV; BAI; BDI	0.24	[-0.18, 0.58]	.267
van der Oord et al. (2006)	65	Journal article	U.S.	Both	CES-D	0.26	[0.02, 0.47]	.036
					Q	Correlation	95% CI	*p*-value
Summary Effect					22.44(10)	0.32	[0.21, 0.42]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.
[b] Sample size ranged from $N = 7$ to $N = 28$ depending on the symptoms analyzed.

Note. ADHD RS-IV = Adult ADHD Rating Scale IV; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory II; CAARS = Conners' Adult ADHD Rating Scale-Self Report; CAARS-S:L = Conners' Adult ADHD Rating Scale-Self Report: Long Version; CES-D = Center for Epidemiologic Studies Depression Scale; DASS-21 = Depression Anxiety Stress Scales-21; SCL-90-R = Symptom Checklist-90-Revised.

Table 13

Characteristics of Studies Included in Analysis of the Degree of Association Between Child's Symptoms of Hyperactivity/Impulsivity and Parental Psychopathology Symptomatology (Research Question 15)

Study	*N*	Publication type	Country of study	Gender of parent	Assessment Measures [a]	Correlation	95% CI	*p*-value
Baumann et al. (2004)	118	Journal article	U.S.	Female	BDI	0.11	[-0.07, 0.29]	.236
Byrnes (2002)	35	Thesis	U.S.	Female	BDI-II	0.32	[-0.01, 0.59]	.061
Leibowtiz (2013)	107	Thesis	U.S.	Female	DASS-21	0.01	[-0.19, 0.19]	.959
Mendelson (2012)	28	Thesis	U.S.	Female	ADHD RS-IV; SCL-90-R	0.29	[-0.09, 0.60]	.137
O'Rourke (2011)	16.5[b]	Thesis	U.S.	Both	BAI; BDI; CAARS	0.16	[-0.56, 0.74]	.693
Patterson (2006)	50	Thesis	U.S.	Female	CAARS-S:L	0.51	[0.27, 0.69]	<.001
Rashap (1998)	79	Thesis	U.S.	Female	SCL-90-R	0.20	[-0.02, 0.40]	.076
Salvato (2000)	45	Thesis	U.S.	Female	BDI-II	0.46	[0.20, 0.67]	.001
Schatz (2009)	24	Thesis	U.S.	Female	ADHD RS-IV; BAI; BDI	0.21	[-0.21, 0.56]	.334
van der Oord et al. (2006)	65	Journal article	U.S.	Both	CES-D	0.36	[0.13, 0.56]	.003
Zisser & Eyberg (2012)	54	Journal article	U.S.	Female	ASR; CAARS	0.12	[-0.15, 0.38]	.386
					Q	Correlation	95% CI	*p*-value
Summary Effect					17.53(10)	0.24	[0.13, 0.35]	<.001

[a] Assessment tool(s) used to measure parental psychopathology.
[b] Sample size ranged from $N = 7$ to $N = 28$ depending on the symptoms analyzed.

Note. ADHD RS-IV = Adult ADHD Rating Scale IV; ASR = Adult Self-Report; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory II; CAARS = Conners' Adult ADHD Rating Scale-Self Report; CAARS-S:L = Conners' Adult ADHD Rating Scale-Self Report: Long Version; CES-D = Center for Epidemiologic Studies Depression Scale; DASS-21 = Depression Anxiety Stress Scales-21; SCL-90-R = Symptom Checklist-90-Revised.

Table 14

Moderator Analyses

Moderator	No. Studies	*Q*	*p*-value	R^2
Percentage of co-occurring externalizing disorders	6	0.71	.400	0.00
ADHD Presentation (% Combined)	5	0.02	.876	0.00
ADHD Presentation (% Predominantly Inattentive)	4	1.51	.219	0.00
ADHD Presentation (% Predominantly hyperactive/impulsive presentation)	4	1.61	.204	0.00
Gender composition of child sample (% Female)	15	0.03	.864	-0.22
Mean age of the child sample	19	0.05	.831	-0.36
Gender composition of parent sample (% Female)	17	0.09	.766	-0.19
Mean age of the parent sample	13	0.05	.832	-0.28
Level of education of parent sample (% who completed high school)	7	1.74	.187	0.70
Family composition (% Biological)	6	0.64	.425	-0.35
Marital status composition of parent sample (% Married)	12	0.25	.618	-0.33
Racial background composition of child sample (% White)	9	0.66	.418	-0.16
Country of study	21	1.27	.737	-0.68
Type of publication	21	5.70	.017	0.94
Year of publication	21	1.35	.245	0.04

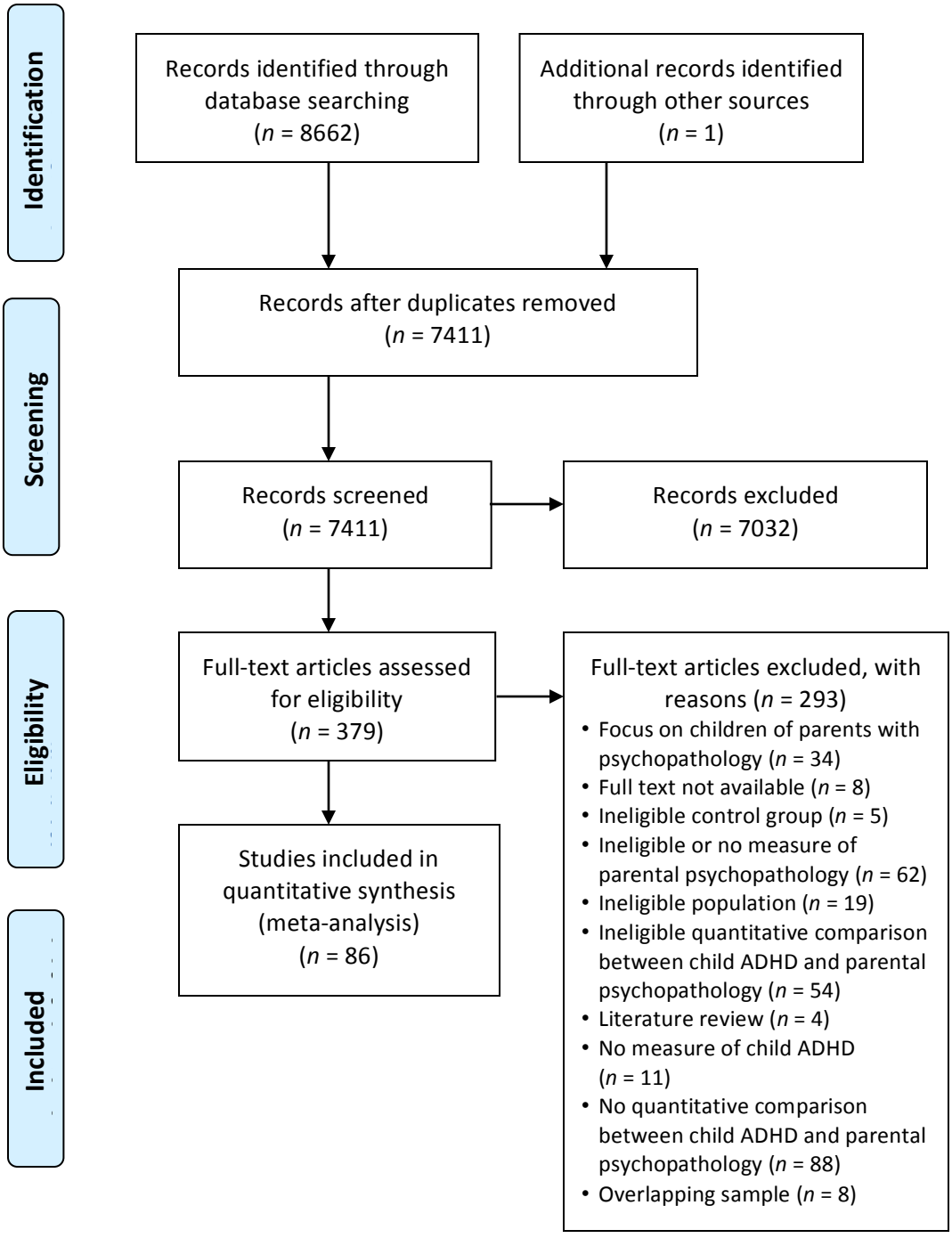

Figure 1: *PRISMA 2009 Flow Diagram*

Appendix A

Coding Manual for Meta-Analysis on ADHD & Parental Psychopathology

General Coding Notes: Record the Study ID number at the top of every page used to code a given study. For every item starting at #5, indicate page number where information found. Ranges are acceptable when needed. For longitudinal and treatment studies, measurements will be recorded at time one/baseline.

I. Study Level Descriptors

1. Bibliographic reference: _____

_____

_____

_____

Write out the study reference in APA format. If two or more written reports were prepared on the same data, use the most comprehensive one.

2. Study ID number: _____

The Study ID number can be found in the "ADHD and Parental Psychopathology meta-analysis tracking file."

3. Type of publication:
   a. Journal article
   b. Book chapter
   c. Conference paper
   d. Thesis or doctoral dissertation
   e. Unpublished data
   f. Other

Please circle the number corresponding to the type of publication of the most comprehensive report consulted for this study.

4a. Publication year: _____
4b. Indicate if only published online to date: Yes/No

5. Place study conducted in: (pg. _____)
   a. US
   b. Canada
   c. Britain
   d. Europe: _____

e. Australia
f. Israel
g. Other: _____

Please indicate the country where the study was conducted.

6. ADHD diagnosed/confirmed by (circle all that apply): (pg. _____)
   a. Previous diagnosis by a qualified health professional *(e.g., psychologist, family physician, pediatrician, psychiatrist) a condition of participation*
   b. K-SADS (*this is a diagnostic interview*)
   c. DISC (*this is a diagnostic interview*)
   d. Study Clinician interview *(any activity undertaken by a qualified professional involved in the study to establish or confirm a diagnosis of ADHD, other than the K-SADS or DISC)*
   e. Questionnaire (e.g., Conner's, BASC, CBCL, ADHD Rating Scale): _____
   f. Other: _____
   g. None

The listing of questionnaires in e is not exhaustive. Other questionnaires may also be used and would be appropriately included in e. For the CBCL and BASC, only scales indicating attention problems or similar would be appropriate. If a procedure other than those listed here is indicated, please circle f, and indicate the procedure.

7. Child psychopathology rated by: (pg. _____)
   a. Psychologist
   b. Psychiatrist
   c. Family physician
   d. Student
   e. Parent
   f. Teacher
   g. Lay interviewer
   h. Other: _____

Please indicate which of the following individual rated the child's psychopathology status.

8. Parental psychopathology diagnosed/confirmed by (circle all that apply): (pg. _____)
   a. Previous diagnosis by a qualified health professional *(e.g., psychologist, family physician, psychiatrist) a condition of participation*
   b. SCID-I or SCID-II or SCID-NP (*this is a diagnostic interview*)
   c. Study Clinician interview *(any activity undertaken by a qualified professional involved in the study to establish or confirm a diagnosis, other than the DISC)*
   d. Questionnaire (e.g., ADHD Adult Rating Scale, BAI, BDI, BDI-II, CES-D, SCL-90-R): _____
   e. Other: _____
   f. None

The listing of questionnaires in (e) is not exhaustive. Other questionnaires may also be used and would be appropriately included in (e). If a procedure other than those listed here is indicated, please circle (f), and indicate the procedure.

9. Parental psychopathology rated by: (pg. _____)
    a. Psychologist
    b. Psychiatrist
    c. Family physician
    d. Student
    e. Self
    f. Partner
    g. Lay interviewer
    h. Other: _____

Please indicate which of the following individual rated the parent's psychopathology status.

10. DSM/ICD version is use for diagnosis (pg. _____)
    a. DSM-R
    b. DSM-III
    c. DSM-IV
    d. DSM-IV-TR
    e. DSM-5
    f. ICD-9
    g. ICD-10
    h. Other: _____
    i. None

11. Type of sample referral: (pg. _____)
    a. Community sample
    b. Clinically referred: Parent OR Child

Please indicate whether the sample was recruited from a community sample or a clinical sample. If the sample was recruited from a clinical sample, please indicate whether it was a clinical sample of the parent or the child.

12. Gender of identified child participants (pg. _____)

	n male	n female	% male	% female
Total Sample				
ADHD group				
Comparison group:				
Other group:				

Indicate whether the sample was restricted males, females, or if both genders were included. If both genders were included, indicate the percentage of the sample that was female.

13. Child age (in years) (pg. _____)

	Mean	SD	Range	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

Indicate the mean age of the sample in years and any subsamples as appropriate. Also indicate the standard deviation (SD) and sample size (n) where this information is available. Note that most studies will not provide information in all the categories. Record as much information as is available. At times you may need to calculate the mean age from other available data. If no age information is provided please write, "doesn't specify" beside child age.

14. ADHD Subtypes/Presentations (pg. _____)

	n	%
Combined Type/Presentation		
Predominantly Inattentive		
Predominantly Hyperactive/Impulsive		

Indicate whether the composition of the sample was a specific ADHD presentation.

15. Medication usage in the child ADHD group: _____% (pg. _____)

Record the percent of participants in the ADHD group (or total sample if a correlational study) that were taking stimulants to treat their ADHD at the time of the study. If this information is not available, write "doesn't specify".

16. Co-occurring externalizing disorders (ODD/CD): (pg. _____)
How defined? _____

	n with	n without	% with	% without
Total Sample				
ADHD group				
Comparison group:				
Other group:				

Indicate whether the sample of consisted of co-occurring externalizing disorders, either ODD/CD. Also, please include how the diagnosis or symptomatology of ODD/CD was confirmed (see #6).

17. Child or Parent ethnic/racial background (pg. _____)

	Caucasian (%)	African American (%)	Latino (%)	Asian American (%)	Other (%)
Total Sample					
ADHD group					
Comparison group:					
Other group:					

Please indicate the ethnic/racial background of either the child or parent sample for studies conducted in North America only. Please indicate whether the sample is a reflection of the child or parent.

18. Parent/Caregiver gender (pg. _____)

	n male (fathers)	n female (mothers)	% male	% female
Total Sample				
ADHD group				
Comparison group:				
Other group:				

Indicate whether the sample was restricted to mothers, fathers, or if both mothers and fathers were included. If both mothers and fathers were included, indicate the percentage of the parents who were mothers. For the purposes of this question, "mother" refers to any custodial female caregiver, while "father" refers to any custodial male caregiver.

19. Parent/Caregiver age (in years) (pg. _____)

	Mean	SD	Range	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

Indicate the mean age of the parents/caregivers and any subsamples as appropriate. Also indicate the standard deviation (SD) and sample size (n) where this information is available. Note that most studies will not provide information in all the categories. Record as much information as is available. At times you may need to calculate the mean age from other available data. If no age information is provided please write, "doesn't specify" beside parent age.

20. Parent/Caregiver sample characteristics: (pg. _____)

	Biological (%)	Adoptive (%)	n
Total Sample			
ADHD group			
Comparison group:			
Other group:			

Indicate whether the sample of families were intact (biological) or not intact (e.g., adoptive, or stepparents).

21. Parent/Caregiver Marital Status: (pg. _____)

	Married/ Cohabiting (%)	Divorced/Separated/ Widowed (%)	Single (%)	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

Indicate the marital status of the parent/caregivers.

22. Number of children in the family (pg. _____)

	Mean	SD	Range	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

Indicate whether the mean number of children in the family (including the child with ADHD) was indicated in the study.

23. Percentage of families in the sample with more than one child (pg. _____)

	%	n
Total Sample		
ADHD group		
Comparison group:		
Other group:		

Please indicate the percentage of families in the sample with more than one child.

24. Parent/Caregiver level of education (pg. _____)

	Less than High school	High School	Some post-secondary education	Completed post-secondary education	n
Total Sample					
ADHD group					
Comparison group:					
Other group:					

Indicate the level of education of the parent/caregiver. Post-secondary education includes trade, College, University Certificate, Diploma, University degree.

II. Group Comparison Studies, Continuous DV

1. Total N (both/all groups): _____

2. Compared to/between:
   a. ADHD and Non-clinical, typically-developing
   b. ADHD alone and ADHD + ODD/CD
   c. ADHD and ODD/CD

If more than one comparison was made (e.g., the individuals with and without ADHD and also, between ADHD presentations) please complete a separate form on each comparison.

3. Type of data effect size based on:
   a. Means and SD
   b. *t*-test
   c. One-way ANOVA

Indicate what type of data the effect size will be based on. They are ordered here in order of preference, with means and standard deviations being the most preferred format. Only choose one.

Parental Psychopathology Outcome: _____
Measured with: _____

Comparison	Mean	SD	n	t	F	df	p
ADHD							
Nonclinical							
ADHD + ODD/CD							
ODD/CD							
Combined							

Inattentive							
Hyperactive/impulsive							

If means, standard deviations (SD) and sample size (n) are available, the other columns (t, F, df, p) do not need to be filled-in. Please note, for ANOVAs, ***only one-way ANOVAs*** *are eligible for effect size calculation. Also, for both t-tests and ANOVAs, record the most specific p value you can locate. If a specific p value is not indicated you may record the alpha level (e.g., $p < .05$) or n.s. for nonsignificant, if appropriate.*

For the purposes of this meta-analysis, please include "oppositional", and "conduct disorder" comparison groups all in the ODD/CD row. The "ADHD + ODD/CD" row is to be used for studies that compared a group consisting solely of children diagnosed with both ADHD and ODD/CD (oppositional defiant disorder/conduct disorder) to a pure ADHD group or other clinical group. Please note that most ADHD groups will have some children with ODD/CD. Unless the entire group has ODD/CD in addition to ADHD, use the "ADHD" row. Also studies which compared children with ADHD with and without aggression, could also be compared using the ADHD + ODD/CD designation.

The "Combined," "Inattentive," and "Hyperactive/impulsive" rows are for comparisons between specific presentations of ADHD. Inattentive referring to the Predominantly Inattentive Presentation, Hyperactive/impulsive referring to the Predominantly Hyperactive-Impulsive presentation, and "Combined" to the Combined presentation of ADHD. These rows should only be used if presentation comparison was explicitly examined as part of the study. They should not be used based upon a characterization of the sample as consisting mostly of children with, for example, the combined presentation of ADHD.

III. Correlational Studies

Note: Partial correlations are an ineligible quantitative comparison for this meta-analysis.

1. Sample
   a. ADHD only
   b. ADHD and non-ADHD
   c. Other: _____

Indicate whether the study investigated parenting stress solely in an ADHD group, in a combined ADHD and non-ADHD group (where ADHD symptoms were then included as a correlation), or in a differently composed group (in which case, please specify).

2. N: _____

3. Correlations with increased parental psychopathology (if n differs from N above, please note appropriate n). If study used a measurement in which lower numbers translate to higher degree of psychopathology, check here and highlight so that effects can be reversed: _____

Under "Measure" indicate the instrument used to measure the construct at hand (e.g., for externalizing problems, the measure may be the CBCL).

Parental Psychopathology Outcome: _____
Measured with: _____

Construct	*r*	*n*	Measure
ADHD symptoms overall			
Inattentive			
Hyperactive/impulsive			

"ADHD symptoms overall" is to be used when ADHD symptoms are linked to parental psychopathology without specifying whether it is the inattentive or the hyperactive-impulsive symptoms being measured.

IV. Chi-square studies/Group Comparison Studies, Categorical DV

Place the appropriate *n* in each box

Parental Psychopathology Outcome: _____
Measured with: _____

	Clinical N	Total N
ADHD		
Nonclinical		
ADHD + ODD/CD		
Combined		
Inattentive		
Hyperactive/impulsive		

V. Categorical DV, prevalence

Place the appropriate **%** in each box

Parental Psychopathology Outcome: _____
Measured with: _____

	Clinical %	Total N
ADHD		
Nonclinical		
ADHD + ODD/CD		
Combined		
Inattentive		
Hyperactive/impulsive		

Appendix B

Coding Form for Meta-Analysis on ADHD & Parental Psychopathology

I. Study Level Descriptors

1. Bibliographic reference: _____

_____

_____

2. Study ID number: _____

3. Type of publication:
   a. Journal article
   b. Book chapter
   c. Conference paper
   d. Thesis or doctoral dissertation
   e. Unpublished data
   f. Other

4a. Publication year: _____
4b. Indicate if only published online to date: Yes/No

5. Place study conducted in: (pg. _____)
   a. US
   b. Canada
   c. Britain
   d. Europe: _____
   e. Australia
   f. Israel
   g. Other: _____

6. ADHD diagnosed/confirmed by (circle all that apply): (pg. _____)
   a. Previous diagnosis by a qualified health professional
   b. K-SADS
   c. DISC
   d. Study Clinician interview
   e. Questionnaire (e.g., Conner's, BASC, CBCL, ADHD Rating Scale):
      _____
   f. Other: _____
   g. None

7. Child psychopathology rated by: (pg. _____)
    a. Psychologist
    b. Psychiatrist
    c. Family physician
    d. Student
    e. Parent
    f. Teacher
    g. Lay interviewer
    h. Other: _____

8. Parental psychopathology diagnosed/confirmed by (circle all that apply): (pg. _____)
    a. Previous diagnosis by a qualified health professional
    b. SADS
    c. DISC
    d. Study Clinician interview
    e. Questionnaire: _____
    f. Other: _____
    g. None

9. Parental psychopathology rated by: (pg. _____)
    a. Psychologist
    b. Psychiatrist
    c. Family physician
    d. Student
    e. Self
    f. Partner
    g. Lay interviewer
    h. Other: _____

10. DSM/ICD version is use for diagnosis (pg. _____)
    a. DSM-R
    b. DSM-III
    c. DSM-IV
    d. DSM-IV-TR
    e. DSM-5
    f. ICD-9
    g. ICD-10
    h. Other: _____
    i. None

11. Type of sample referral: (pg. _____)
    a. Community sample
    b. Clinically referred: Parent OR Child

12. Gender of identified child participants (pg. _____)

	n male	n female	% male	% female
Total Sample				
ADHD group				
Comparison group:				
Other group:				

13. Child age (in years) (pg. _____)

	Mean	SD	Range	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

14. ADHD Subtypes/Presentations (pg. _____)

	n	%
Combined Type/Presentation		
Predominantly Inattentive		
Predominantly Hyperactive/Impulsive		

15. Medication usage in the child ADHD group: _____% (pg. _____)

16. Co-occurring externalizing disorders (ODD/CD): (pg. _____)
How defined? _____

	n with	n without	% with	% without
Total Sample				
ADHD group				
Comparison group:				
Other group:				

17. Child or Parent ethnic/racial background (pg. _____)

	Caucasian (%)	African American (%)	Latino (%)	Asian American (%)	Other (%)
Total Sample					
ADHD group					
Comparison group:					
Other group:					

18. Parent/Caregiver gender (pg. _____)

	n male (fathers)	n female (mothers)	% male	% female
Total Sample				
ADHD group				
Comparison group:				
Other group:				

19. Parent/Caregiver age (in years) (pg. _____)

	Mean	SD	Range	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

20. Parent/Caregiver sample characteristics: (pg. _____)

	Biological (%)	Adoptive (%)	n
Total Sample			
ADHD group			
Comparison group:			
Other group:			

21. Parent/Caregiver Marital Status: (pg. _____)

	Married/ Cohabiting (%)	Divorced/ Separated/ Widowed (%)	Single (%)	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

22. Number of children in the family (pg. _____)

	Mean	SD	Range	n
Total Sample				
ADHD group				
Comparison group:				
Other group:				

23. Percentage of families in the sample with more than one child (pg. _____)

	%	n
Total Sample		
ADHD group		
Comparison group:		
Other group:		

24. Parent/Caregiver level of education (pg. _____)

	Less than High school	High School	Some post-secondary education	Completed post-secondary education	n
Total Sample					
ADHD group					
Comparison group:					
Other group:					

II. Group Comparison Studies, Continuous DV

1. Total N (both/all groups): _____

2. Compared to/between:
   a. ADHD and Non-clinical, typically-developing
   b. ADHD alone and ADHD + ODD/CD
   c. ADHD and ODD/CD

3. Type of data effect size based on:
   a. Means and SD
   b. *t*-test
   c. One-way ANOVA

Parental Psychopathology Outcome: _____
Measured with: _____

Comparison	Mean	SD	n	t	F	df	p
ADHD							
Nonclinical							
ADHD + ODD/CD							
ODD/CD							
Combined							
Inattentive							
Hyperactive/impulsive							

III. Correlational Studies

1. Sample
   a. ADHD only
   b. ADHD and non-ADHD
   c. Other: _____

2. N: _____

3. Check here and highlight so that effects can be reversed: _____

Parental Psychopathology Outcome: _____
Measured with: _____

Construct	*r*	*n*	Measure
ADHD symptoms overall			
Inattentive			
Hyperactive/impulsive			

IV. Chi-square studies/Group Comparison Studies, Categorical DV

Parental Psychopathology Outcome: _____
Measured with: _____

	Clinical N	Total N
ADHD		
Nonclinical		
ADHD + ODD/CD		
Combined		
Inattentive		
Hyperactive/impulsive		

V. Categorical DV, prevalence

Parental Psychopathology Outcome: _____
Measured with: _____

	Clinical %	Total N
ADHD		
Nonclinical		
ADHD + ODD/CD		
Combined		
Inattentive		
Hyperactive/impulsive		