


Meta-Analysis of Sex Differences in ADHD Symptoms and Associated Cognitive Deficits

Journal of Attention Disorders
1–17
© The Author(s) 2020
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1087054720923736
journals.sagepub.com/home/jad


Maryanne Loyer Carbonneau¹ , Martin Demers¹, Marc Bigras¹,
and Marie-Claude Guay¹

Abstract

Objective: A meta-analysis was carried out to determine whether there are sex differences among children and adolescents with ADHD on the primary symptoms of ADHD and on executive and attentional functioning. **Method:** Studies published from 1997 to 2017 comparing boys and girls with a valid ADHD diagnosis were retained. **Results:** The meta-analysis found boys with ADHD to be more hyperactive than girls with ADHD and boys to have more difficulties in terms of motor response inhibition and cognitive flexibility. Results also confirm that youths with ADHD have more executive deficits than non-ADHD peers have, but there is no sex difference in this regard. **Conclusion:** Results show that there are sex differences in the behavioral expression of the difficulties related to ADHD. This highlights the importance of pursuing research to refine the profile of girls with ADHD and to develop diagnostic criteria adapted to each sex. (*J. of Att. Dis.* XXXX; XX[X] XX-XX)

Keywords

ADHD, sex differences, symptoms, cognitive deficits, meta-analysis

ADHD is a neurodevelopmental disorder that affects about 5% of children (American Psychiatric Association [APA], 2013), making it one of the most prevalent childhood disorders. A more recent study even suggests a higher percentage. Result from the National Survey of Children's Health states that 9.4% of children between 2 and 17 years old in the United States received an ADHD diagnostic (Danielson et al., 2018). Under the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; APA, 2013), the primary symptoms of ADHD are inattention, hyperactivity, and impulsivity behaviors that do not correspond to the child's developmental level and that impair the child's everyday functioning. Moreover, it is generally recognized that persons with ADHD have more attentional function deficits (e.g., Günther et al., 2011; Spronk et al., 2008) and more executive function deficits than persons without ADHD (e.g., Martinussen et al., 2005; Shallice et al., 2002; Willcutt et al., 2005). Attentional functions refer to the ability to supply a sustained mental effort (sustained attention), to focus one's attention on relevant information (selective attention), and to divide one's attention on multiple concurrent tasks (divided attention). Executive functions refer to the skills required to accomplish goal-directed tasks. The main functions are working memory, planning, cognitive flexibility, motor response inhibition, and interference control (Sergeant et al., 2002; Willcutt et al., 2005).

ADHD is more prevalent among boys, at a ratio of two to one (APA, 2013). A recent study has shown that 5.9% of boys and 3.04% of girls were diagnosed with ADHD before reaching 18 years old (Dalsgaard et al., 2019). The males to females ratio seems to be higher in clinical samples than in community samples (Gaub & Carlson, 1997; Nøvik et al., 2006; Ramtekkar et al., 2010). Although the percentage of girls with ADHD is nevertheless high (Staller & Faraone, 2006) and despite the consequences of the disorder for their psychosocial functioning (e.g., Rucklidge & Tannock, 2001), academic functioning (e.g., Hinshaw, 2002), and cognitive functioning (e.g., Biederman et al., 2008; Hinshaw et al., 2002), ADHD has been studied primarily in boys. It is reasonable to suppose that ADHD is experienced, diagnosed, and treated differently depending on the sex of the child affected. Two meta-analyses were published more than 15 years ago (Gaub & Carlson, 1997; Gershon, 2002a) to determine more clearly whether girls and boys

¹Université du Québec à Montréal, Canada

Corresponding Author:

Marie-Claude Guay, Département de psychologie, Université du Québec à Montréal, C.P. 8888 succursale Centre-ville Montréal, Montréal, Québec, Canada H3C 3P8.
Email: guay.marie-claude@uqam.ca

with ADHD differed in terms of symptoms expression. Regarding sex differences on cognitive deficits associated with ADHD, the meta-analysis by Gershon (2002a) examined sustained attention, motor response inhibition, and interference control, and a more recent one by Hasson and Fine (2012) looked at sustained attention and motor response inhibition. Since the meta-analyses by Gaub and Carlson (1997) and Gershon (2002a) were published, efforts have been made to include girls in the samples of empirical studies. Results to date have been mixed. Whereas several studies support the existence of sex differences in the symptomatology of ADHD and in the cognitive deficits associated, others do not.

Sex Differences, Executive Functions, and Attentional Functions

According to research, girls with ADHD have more difficulty than girls without ADHD have on tasks that measure executive and attentional functions, whether in childhood (Hinshaw et al., 2002; Seidman et al., 2005), adolescence (Hinshaw et al., 2007; Seidman et al., 2005), or adulthood (Biederman et al., 2008; Miller et al., 2013). However, few studies have observed sex differences in the executive functioning of youths with ADHD (Hasson & Fine, 2012; O'Brien et al., 2010). Studies have suggested rather that girls have deficits comparable with those of boys, regarding inhibition (Houghton et al., 1999; Rucklidge & Tannock, 2002), cognitive flexibility (Houghton et al., 1999; Seidman et al., 2005), planification (Houghton et al., 1999), working memory (Rucklidge & Tannock, 2002), and attention (Seidman et al., 2005).

Two meta-analyses compared the executive and attentional functions of girls and boys with ADHD. Hasson and Fine (2012) and Gershon (2002a) focused on motor response inhibition and sustained attention, as measured via the CPT-II test (Conners, 1994). Only Gershon also considered interference control as measured by the Stroop test (Stroop, 1935) and the Matching Familiar Figures Test (Kagan, 1966). Gershon took into account all studies published from 1983 to 1999 that compared people of all ages with a valid ADHD diagnosis. Hasson and Fine, for their part, included all studies published from 1989 to 2006 but applied more restrictive selection criteria: only one instrument of measure (Continuous Performance Test–II [CPT-II]) was considered, age of participants was limited to 6 to 18 years, participants had to be unmedicated at the time of testing, and studies had to be published in a peer-reviewed journal. Whereas Gershon observed no significant difference between boys and girls, Hasson and Fine found that boys demonstrated a greater motor response inhibition deficit than girls did, although the effect size was small ($d = 0.31$). However, the differences mentioned above regarding the selection criteria used might explain the incongruence of the results.

Sex Differences and Primary Symptoms of ADHD

The meta-analyses by Gaub and Carlson (1997) and Gershon (2002a) assessed sex differences regarding the primary symptoms of ADHD as measured via behavioral questionnaires. Gaub and Carlson included studies with participants aged 13 and below with a minimum IQ of 80, and at least 10 participants per group. The two meta-analyses showed that boys with ADHD were more inattentive and hyperactive than girls with ADHD were. Where impulsive behaviors are concerned, there is no consensus on sex differences. Only the meta-analysis by Gershon has shown boys to have more impulsive behaviors than girls have.

Results from more recent studies are inconsistent. Some studies have suggested sex differences in ADHD symptoms. For example, Elkins et al. (2011) found that boys with ADHD were more hyperactive–impulsive than girls, but no difference in inattention symptoms was found. Results from a large study with participants from eight different countries rather suggest more inattention symptoms for boys and no difference for hyperactivity–impulsivity symptoms (Muller et al., 2011a). However, not all studies found differences between boys and girls with ADHD (M. Chen et al., 2008; Mayfield et al., 2016; Skogli et al., 2013).

Moreover, it is interesting to note that significant differences have emerged depending on whether behaviors were observed by teachers or parents. Parents have tended to report the same primary symptoms of ADHD in boys and girls (Graetz et al., 2005; Mayfield et al., 2016; Nøvik et al., 2006). Teachers, instead, have tended to report boys as more inattentive, hyperactive, and impulsive than they do girls (DuPaul et al., 2006; Hartung et al., 2002; Isaksson et al., 2016; Wang et al., 2015).

Knowledge Gap

A major limitation of the studies reviewed is that most recruited their participants in clinical settings rather than in the community. In fact, it has been demonstrated that girls with ADHD are not referred and diagnosed as well as boys are (Gershon, 2002b; Hinshaw & Blachman, 2005; Madsen et al., 2018; Quinn & Nadeau, 2002). Indeed, girls tend to be diagnosed much later than boys (Dalsgaard et al., 2019). Also, girls who are referred clinically tend to have more severe deficits and are thus not representative of girls with ADHD as a whole (Hinshaw, 2002; Hinshaw & Blachman, 2005; Rucklidge, 2010).

Furthermore, in the two meta-analyses that examined sex differences on primary symptoms of ADHD, most of the studies considered used the *Diagnostic and Statistical Manual of Mental Disorders* (2nd ed., *DSM-II*; APA, 1968) or *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., rev.; *DSM-III-R*; APA, 1987) diagnostic criteria for ADHD. However, these criteria changed considerably from

the third to the fourth edition of the *DSM*. A new meta-analysis of studies that used the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; APA, 1994) diagnostic criteria was clearly warranted.

The two meta-analyses to date that have looked at sex differences in the cognitive deficits associated with ADHD examined only motor response inhibition, sustained attention (Gershon, 2002a; Hasson & Fine, 2012), and interference control (Gershon, 2002a). As it happens, it is recognized that people with ADHD have other deficits that merit consideration in a meta-analysis, such as those relating to working memory, planning, and cognitive flexibility (Martinussen et al., 2005; Shallice et al., 2002; Willcutt et al., 2005). This would serve to arrive at a more comprehensive picture of the differences between girls and boys with ADHD regarding executive functioning.

Another critical aspect is to find out whether the sex differences observed in the youth population with ADHD vary by age group (childhood vs. adolescence) and ADHD type (predominantly inattentive, predominantly hyperactive-impulsive, combined). So far, the moderating effect of age has been considered by Gershon (2002a) alone, but the conclusions to be drawn are limited by the fact that children were compared against adolescents and adults together.

Study Objectives

Against this background, we undertook a meta-analysis to verify whether sex differences existed among children and adolescents with ADHD in terms of (a) primary symptoms of ADHD (inattention, hyperactivity, and impulsivity) and (b) executive and attentional functioning (attention, inhibition, working memory, cognitive flexibility, planification). To do so, we first compared boys and girls with ADHD on each variable. The moderating effects of age group, recruitment setting (clinical or community), informant (parent or teacher), ADHD type, and *DSM* version used for diagnosis were taken into account.

As a secondary goal, for the studies that included a typically developing control group (children and/or adolescents without ADHD), we compared girls with and without ADHD, as well as boys with and without ADHD, and then the difference between those two groups. This analysis of relative differences seems appropriate to us because the meta-analysis of Hasson and Fine (2012) suggests a greater difference in the level of inhibition between boys with and without ADHD, compared with girls with and without ADHD.

Method

Article Search and Selection

The methods were defined prior to the beginning of the search. Articles were searched by two separate investigators

on October 4, 2017, in the following databases: PsycInfo/PsycArticles, PubMed, ERIC (with ProQuest and EBSCO), Scopus, Cochrane, and Education Source (with EBSCO). The following keywords were used: *ADHD* OR *attention deficit disorder* AND *Gender* OR *sex* AND (*cognitive* OR *neuropsychological* OR *executive function* OR *shifting* OR *working memory* OR *inhibition* OR *planning*) OR (*symptom* OR *severity*). The search terms were selected to cover all the variables included and were inspired by the keywords used in relevant articles. The search was limited to articles published from 1997 to 2017. A manual search of the references of the articles found was also carried out by the two investigators separately to uncover other articles. Eligible articles were those with boys and girls between 3 and 17 years with a valid diagnosis of ADHD according to the criteria of *DSM-IV*, *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; APA, 2000), or *DSM-5* (APA, 1994, 2000, 2013), or CIM-10 (Classification statistique internationale des maladies et problèmes de santé connexes, Dixième révision; Organisation mondiale de la santé [OMS], 2008). Boys and girls had to be compared on at least one of the variables of interest measured by a valid instrument. The variables in question were the primary symptoms of ADHD, that is, inattention, hyperactivity, and impulsivity, as well as executive and attentional functions, namely, working memory, motor response inhibition, interference control, planning, cognitive flexibility, and attention. Validated instruments for ADHD symptoms were behavioral measures such as the Conners' rating scales (Conners, 1997) or the ADHD-Rating Scale-IV-Parent (DuPaul et al., 1998). Instruments for cognitive functions included validated cognitive tasks such as the CPT (Conners, 1994), the Trail Making Test, or the Color-Word Interference Test (Delis-Kaplan Executive Functioning; Delis et al., 2001). Results for the measure had to be presented in a way that allowed us to calculate the effect size (e.g., means, standard deviations, sample size, *p* value). Articles written in languages other than English were eligible.

The articles were selected by two separate investigators as well. The articles were first screened on the basis of their title and abstract. An article was retained if any of the variables of interest was measured and the participants met the selection criteria. To avoid eliminating articles of relevance, we kept articles at this stage of the process even if a comparison of the sexes was not mentioned in the abstract. Next, a second wave of screening based on the full text of each of the articles retained was conducted by each investigator separately. At this point, articles had to meet all of the inclusion criteria. Interrater reliability was 88% (i.e., 272/310 articles). Disagreements were settled by consensus.

An assessment of the quality of the studies was also carried out by the two investigators separately. Any disagreement was again resolved by consensus. The assessment was

informed by the Cochrane Collaboration's tool for assessing risk of bias (Higgins & Green, 2011). The investigators had to rate the risk of bias (low, high, or unclear) in the following domains: selection bias, performance bias, evaluation process bias, results analysis bias, and reporting bias.

Statistical Analyses

The statistical analyses were run on Comprehensive Meta-Analysis–Version 3 (CMA; Borenstein et al., 2013). Sex differences in terms of ADHD symptoms and executive and attentional functioning were calculated using Hedges' g as estimator, with a 95% confidence interval. For each variable, effect size was calculated for each individual study using the reported data (mean, standard deviations, and sample size; or p value and sample size; or means, sample size, and p value). If there were different measures of a variable in a study (e.g., number of inattention symptoms reported by parent and by teacher), each measure was first entered individually, and then the measures were grouped into a single effect size. A combined effect size was calculated for all the variables, using the random-effect model. The direction of the effect size was considered negative when boys showed more ADHD symptoms or executive and attentional deficits. To determine the existence of sex differences among children with or without ADHD, the same procedure was applied to calculate effect size for each sex and then the difference between the two effect sizes for each variable.

Effect size heterogeneity was assessed through the Q statistic and the I^2 statistic, which is reported to indicate the percentage of the total variance in effects due to actual differences between the samples. For variables where heterogeneity proved significant, subgroup analyses were conducted to determine the potential moderating effects of age group (3–5, 6–11, 12–17 years old), ADHD type (combined, inattentive, or hyperactive–impulsive), recruitment setting (community, clinics), informant (parent, teacher), and *DSM* version used (*DSM-IV*, *DSM-IV-TR*, *DSM-V*).

Publication biases were assessed using Begg's rank correlation test (Begg & Mazumdar, 1994) and Egger's test (Egger et al., 1997). These tests serve to assess the symmetry of the funnel plot, where asymmetry indicates a potential publication bias.

Results

Study Selection

The article selection process is summarized in Figure 1. The database search yielded 3,624 articles, of which 1,144 duplicates were eliminated, leaving 2,480. Screening based on title and abstract resulted in 2,178 articles being eliminated. The remaining 302 articles were screened

based on the full text. From these, 252 were eliminated for the following reasons: no valid ADHD diagnosis, no relevant variable measured, no boy–girl comparison, age range not respected ($n = 247$), and full text could not be found ($n = 5$). The remaining 50 articles were included in the meta-analysis. A manual search of the references of these articles yielded four other relevant articles, for a total of 54 articles involving 47 different samples. The characteristics of these studies are presented in Table 1.

Assessment of Quality of Studies

Generally speaking, the principal risks of bias concerned participant selection and performance. Regarding selection biases, numerous studies used samples drawn from clinical settings, which limited their representativeness. A fair number of studies reported no information regarding participant attrition. Moreover, risks of performance biases were also present. The description of the methodological procedures did not always allow assessing risk of bias, or the method used did not allow doing blind evaluations regarding presence or absence of ADHD in participants or regarding research questions and objectives. The risks of bias were generally low regarding the relevance of the evaluation tools, the data analysis techniques, and the reporting of results. A summary of the quality of included studies is provided in Supplemental Table S1.

Comparing Boys and Girls With ADHD

Sex differences in ADHD symptoms. The results of the meta-analysis are presented in Table 2. A positive effect size indicated more severe symptoms in girls, whereas a negative effect size indicated more severe symptoms in boys. Regarding the primary symptoms of ADHD, only one significant difference emerged between boys and girls with ADHD. Boys expressed more hyperactivity symptoms than girls did ($g = -0.154$, $p = .010$, 95% CI = $[-0.339, 0.030]$). No sex difference was observed on any of the other variables.

When results were analyzed separately for parents and teachers, other sex differences emerged. Teachers reported boys had more inattention ($g = -0.304$, $p = .006$, 95% CI = $[-0.521, -0.087]$) and hyperactive–impulsive ($g = -0.204$, $p = .022$, 95% CI = $[-0.377, -0.030]$) behaviors than girls did.

The heterogeneity tests (Table 2) showed significant heterogeneity between effect sizes for inattention behaviors, $Q_{(26)} = 75.239$, $p < .001$, $I^2 = 66.8\%$, hyperactivity–impulsivity behaviors, $Q_{(24)} = 44.009$, $p = .005$, $I^2 = 47.74\%$, and total symptoms, $Q_{(15)} = 42.218$, $p < .001$, $I^2 = 66.8\%$. Consequently, we ran analyses on a subgroup to determine the potential sources of this heterogeneity. These revealed no difference by age group, recruitment setting, or *DSM* version used with respect to level of inattention, level of

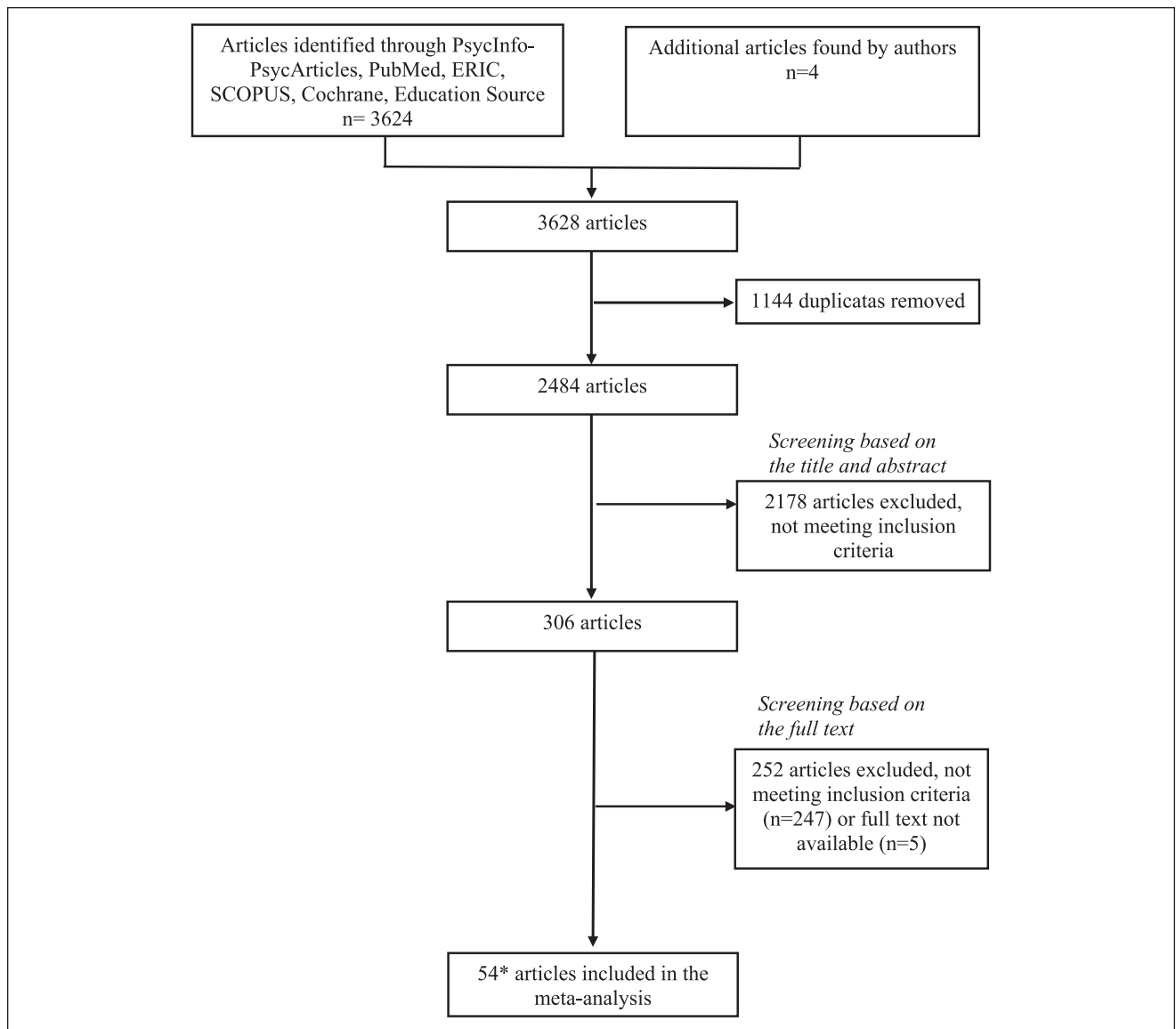


Figure 1. Flowchart of the search and selection procedure.

*Forty-seven different samples.

hyperactivity–impulsivity, and total symptoms (see Table 3). The principal source of heterogeneity was the informant (parents or teachers), where inattention symptoms were concerned, $Q_{(31)} = 7.831, p = .005$, as a sex difference emerged only when children were assessed by teachers. No moderating effect of informant was observed with respect to hyperactive–impulsive behaviors, $Q_{(29)} = 0.816, p = .366$, and total symptoms, $Q_{(18)} = 2.285, p = .131$.

Sex differences in cognitive functions. Regarding executive and attentional functions, significant differences between boys and girls with ADHD emerged on inhibition (motor response inhibition and interference control together;

$g = -0.149, p = .013, 95\% \text{ CI} = [-0.266, -0.031]$) and cognitive flexibility ($g = -0.174, p = .015, 95\% \text{ CI} = [-0.314, -0.034]$). Accordingly, boys scored higher than girls did in this respect, though the effect sizes proved small. No significant difference was noted on working memory ($g = 0.029, p = .694, 95\% \text{ CI} = [-0.114, 0.171]$), planning ($g = -0.113, p = .396, 95\% \text{ CI} = [-0.372, 0.147]$), and attention ($g = -0.016, p = .791, 95\% \text{ CI} = [-0.132, 0.101]$).

A significant heterogeneity across effect sizes was present for inhibition, $Q_{(23)} = 33.857, p = .051, I^2 = 35.0\%$. Subgroup analyses revealed a moderating effect of ADHD type, $Q_{(22)} = 6.945, p = .008$. In this regard, only studies that included youths with ADHD inattentive type noted

Table 1. Characteristics of the Studies Included in the Meta-Analysis.

Number	Studies	n % of boys	Country	Age	Criteria used for diagnostic	ADHD type	Recruitment settings	Variables included
1	Alford (2007)	30 53%	United States	7–14 years	DSM-IV-TR	Combined	Clinics and community	Inhibition, cognitive flexibility, attention
2	Bligic et al. (2016)	34 71%	Turkey	6–11 years	DSM-V	Combined	Missing data	Inattention, hyperactivity–impulsivity
3	Borschuk et al. (2018)	71 69%	United States	6–18 years	Missing data	All	Clinics	Hyperactivity–impulsivity, hyperactivity
4	G. F. Chan et al. (2014)	180 47%	China	6–12 years	DSM-IV	All	Clinics	Inattention, hyperactivity–impulsivity
5	T. Chan & Martinussen (2016)	49 65%	Canada	14–17 years	DSM-IV	All	Clinics and community	Working memory
6	M. Chen et al. (2008)	36 47%	Canada	5–13 years	DSM-IV	Inattention, hyperactivity–impulsivity	Community	Inattention, hyperactivity–impulsivity
7	Coccini et al. (2009)	44 89%	Italy	4–17 years	DSM-IV-TR	All	Clinics	Inattention, hyperactivity–impulsivity
8	Derks et al. (2006)	81 56%	Netherlands	10–13 years	DSM-IV	All	From a longitudinal study	Total symptoms
9	Diaz-Orueta et al. (2014)	57 74%	Spain	6–16 years	DSM-IV-TR	All	Clinics	Inhibition, hyperactivity
10	DuPaul et al. (2006)	175 76%	United States	M = 8.5 (1.2)	DSM-IV-TR	All	Community	Inattention, hyperactivity–impulsivity
11	Elkins et al. (2011)	253 57%	United States	11 years	DSM-IV-TR	All	From a longitudinal study	Inattention, hyperactivity–impulsivity
12	Gau et al. (2009)	53 75%	Taiwan	11–16 years	DSM-IV	All	Clinics	Working memory
13	Gökçe et al. (2017)	156 58%	Turkey	11–18 years	DSM-IV	Inattention combined	Clinics	Inattention, impulsivity, hyperactivity–impulsivity, total symptoms
14	Graetz et al. (2005)	324 69%	Australia	6–13 years	DSM-IV	All	Clinics and community	Inattention
14	Graetz et al. (2006)	398 70%	Australia	6–17 years	DSM-IV	All	Community	Total symptoms
15	Günther et al. (2010)	54 50%	Germany	8–12 years	DSM-IV-TR	Inattention combined	Clinics	Total symptoms, inhibition, cognitive flexibility, attention
16	Günther et al. (2015)	175 49%	Germany	8–14 years	DSM-IV	Combined	Clinics	Total symptoms, inhibition, cognitive flexibility, attention
17	Hartung et al. (2002)	127 83%	United States	3–7 years	DSM-IV	All	Clinics and community	Inattention, hyperactivity–impulsivity
18	Heckel et al. (2009)	479 70%	Australia	6–18 years	DSM-IV	Inattention combined	Clinics	Inattention, hyperactivity–impulsivity, total symptoms
19	Huang et al. (2012)	103 80%	Taiwan	6 - 16 years	DSM-IV	All	Clinics	Inhibition, attention
20	Isaksson et al. (2016)	137 78%	Sweden	M = 11.8 (2.8)	Missing data	Inattention combined	Clinics	Inattention, hyperactivity–impulsivity, total symptoms

(continued)

Table 1. (continued)

Number	Studies	n % of boys	Country	Age	Criteria used for diagnostic	ADHD type	Recruitment settings	Variables included
17	Lahey et al. (2007)	118 83%	United States	6–11 years	DSM-IV	All	Clinics and community	Inattention, hyperactivity–impulsivity
21	Lambek et al. (2010)	101 65%	Denmark	6–14 years	CIM-10	Inattention combined	Clinics	Inattention, hyperactivity–impulsivity, planning
22	Lockwood et al. (2001)	80 50%	United States	6–13 years	DSM-IV	Inattention combined	Clinics	Inhibition, working memory, attention
23	Mahone et al. (2009)	60 60%	United States	8–12 years	DSM-IV	All	Clinics and community	Inhibition, working memory, total symptoms
24	Martel (2009)	168 63%	United States	8–13 years	DSM-IV-TR	All	Clinics and community	Inhibition, cognitive flexibility
25	Mayfield et al. (2016)	337 72%	United States	6–16 years	DSM-IV	Inattention combined	Clinics and community	Inattention, hyperactivity, impulsivity
26	Montiel-Nava et al. (2007)	169 73%	Venezuela	4–13 years	DSM-IV	All	Clinics	Inattention, hyperactivity–impulsivity, total symptoms
27	Muller et al. (2011a)	1068 88%	Europe (several countries)	5–17 years	DSM-IV	Combined	Clinics	Inattention, hyperactivity–impulsivity
27	Muller et al. (2011b)	1068 88%	Europe (several countries)	5–17 years	DSM-IV	Combined	Clinics	Inattention, hyperactivity–impulsivity
28	Newcorn et al. (2001)	498 80%	United States	7–9 years	DSM-IV	All	MTA study	Total symptoms, inhibition, attention
29	Nigg et al. (2002)	74 64%	United States	7–12 years	DSM-IV	Inattention combined	Clinics and community	Inhibition
30	Nolan et al. (1999)	222 77%	United States	3–18 years	DSM-IV	All	Clinics	Inattention, hyperactivity–impulsivity, total symptoms
23	O'Brien et al. (2010)	56 53%	United States	8–13 years	DSM-IV	All	Clinics and community	Total symptoms, inhibition, working memory,
31	Øie et al. (2016)	75 52%	Norway	9–16 years	DSM-IV-TR	All	Clinics	Inattention, hyperactivity–impulsivity, inhibition, working memory, cognitive flexibility
32	Prout (2000)	79 52%	Canada	7–13 years	DSM-IV	Inattention combined	Clinics and community	Inhibition
33	Radonovich (2002)	152 77%	United States	Girls M = 11.28; boys M = 10.14	DSM-IV	Inattention combined	Clinics	Inhibition, cognitive flexibility, attention
34	Riddle et al. (2013)	207 75% Year 3: 206 75% Year 6: 186 74%	United States	3–12 years	DSM-IV-TR	Hyperactivity– impulsivity combined	Clinics	Inattention, hyperactivity–impulsivity
35	Rosch et al. (2015)	107 66%	United States	8–12 years	DSM-IV	All	Community	Inattention, hyperactivity–impulsivity, inhibition, working memory

(continued)

Table 1. (continued)

Number	Studies	n % of boys	Country	Age	Criteria used for diagnostic	ADHD type	Recruitment settings	Variables included
36	Rucklidge (2006)	49 49%	New Zealand	13–17 years	DSM-IV-TR	All	Clinics	Inattention, hyperactivity–impulsivity, inhibition, working memory, cognitive flexibility, attention
37	Rucklidge & Tannock (2001)	69 51%	Canada	13–16 years	DSM-IV	All	Clinics	Inattention, hyperactivity–impulsivity, working memory
37	Rucklidge & Tannock (2002)	108 32%	Canada	13–16 years	DSM-IV	All	Clinics	Total symptoms, inhibition
38	Rumsey (2004)	161 65%	United States	6–16 years	DSM-IV	All	Clinics	Inhibition, working memory
35	Seymour et al. (2016)	81 51%	United States	8–12 years	DSM-IV	All	Community	Inattention, hyperactivity–impulsivity, inhibition, working memory, attention
39	Sjöwall et al. (2013)	102 45%	Sweden	7–13 years	DSM-IV	All	Clinics	Inhibition, working memory, cognitive flexibility
40	Skogli et al. (2013)	80 54%	Norway	8–17 years	DSM-IV	All	Clinics	Inattention, hyperactivity–impulsivity, inhibition, working memory, planification, cognitive flexibility
41	Sonuga-Barke et al. (2007)	184 74%	United Kingdom	6–12 years	DSM-IV	All	Clinics	Inattention, hyperactivity–impulsivity
42	Sonuga-Barke & Rubia (2008)	20 85%	United Kingdom	M = 12.9	Missing data	Combined	From a sample	Inattention, hyperactivity, impulsivity, inhibition, cognitive flexibility
43	Wang et al. (2015)	154 83%	Taiwan	6–18 years	DSM-IV-TR	All	Clinics	Inattention, hyperactivity–impulsivity, inhibition, attention
44	Wehmeier et al. (2012)	794 89%	Canada Europe	M = 9.6 years	DSM-IV-TR	All	Clinics	Inattention, hyperactivity–impulsivity, total symptoms
45	Wodka et al. (2007)	58 62%	United States	7–16 years	DSM-IV	All	Clinics and community	Inhibition, attention
45	Wodka et al. (2008)	54 59%	United States	8–15 years	DSM-IV	All	Clinics and community	Inhibition, planification, cognitive flexibility
46	Yang et al. (2004)	42 50%	Taiwan	6–11 years	DSM-IV	Combined	Clinics	Total symptoms, inhibition, attention
47	Zhou et al. (2006)	209 77%	Missing data	Boys M = 7.71 (1.44); girls M = 8.63 (2.14)	DSM-IV	All	Clinics	Total symptoms

Note. CIM-10 = Classification mondiale des maladies et problèmes de santé connexes; DSM-IV-TR = Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.); DSM-V = Diagnostic and Statistical Manual of Mental Disorders (5th ed.); DSM-5; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders (4th ed.); DSM-IV; MTA = Multimodal Treatment of Attention Deficit Hyperactivity Disorder Study.

Table 2. Differences Between Boys and Girls With ADHD.

Domain	Samples included	n	Hedges' g	95% CI	p	Heterogeneity	
						Q value	I ²
Inattention	2, 4, 6, 7, 10, 11, 13, 14, 17, 18, 20, 21, 25, 28, 27, 30, 31, 34, 35, 36, 37, 40, 41, 42, 43, 44	26	-0.040	[-0.169, 0.090]	.547	75.239***	66.772
Hyperactivity-impulsivity	2, 3, 4, 6, 7, 10, 11, 13, 17, 18, 20, 21, 26, 27, 30, 31, 34, 35, 37, 40, 41, 43, 44, 36	24	-0.081	[-0.187, 0.025]	.134	44.009**	47.738
Hyperactivity	3, 9, 25, 42	4	-0.154	[-0.339, 0.030]	.0102	2.912	0.000
Impulsivity	13, 25, 42	3	-0.124	[-0.315, 0.068]	.205	0.286	0.000
Total symptoms	8, 13, 14, 15, 16, 18, 20, 23, 26, 28, 30, 37, 44, 46, 47	15	0.031	[-0.137, 0.101]	.718	42.218***	66.839
Attention	1, 15, 16, 19, 22, 28, 33, 35, 36, 43, 45, 46	12	-0.016	[-0.132, 0.101]	.791	4.282	0.000
Inhibition	1, 9, 15, 16, 19, 22, 23, 24, 28, 29, 31, 32, 33, 35, 36, 37, 38, 39, 40, 42, 43, 45, 46	23	-0.149*	[-0.266, -0.031]	.013	33.857*	35.021
Motor response inhibition	1, 9, 15, 16, 19, 22, 23, 24, 28, 29, 32, 33, 35, 36, 37, 38, 39, 42, 43, 46, 45	21	-0.136*	[-0.251, -0.021]	.020	26.697	25.084
Interference control	1, 22, 23, 31, 33, 36, 37, 40, 45	9	0.120	[-0.309, 0.069]	.214	4.543	0.000
Working memory	5, 12, 22, 25, 31, 35, 36, 37, 38, 39, 40	11	0.029	[-0.114, 0.171]	.694	6.905	0.000
Cognitive flexibility	1, 15, 16, 24, 31, 33, 36, 39, 42, 40, 45	11	-0.174*	[-0.314, -0.034]	.015	10.637	5.991
Planning	21, 40, 45	3	-0.113	[-0.372, 0.147]	.396	2.138	6.446

Note. n = number of studies; CI = confidence interval.

*p < .05. **p < .01. ***p < .001.

Table 3. Moderator Analyses.

Domain	Age group		Recruitment setting		ADHD type		DSM version		Informant (teacher or parent)	
	n	Q value ^a	n	Q value ^a	n	Q value ^a	n	Q value ^a	N	Q value ^a
Inattention	27	8.080	23	1.491	26	3.107	24	1.447	31	7.831**
Hyperactivity-impulsivity	25	6.981	22	3.055	24	1.196	22	1.472	29	0.816
Total symptoms	15	2.868	13	3.548	15	0.478	14	0.003	18	2.285
Inhibition	17	3.343	21	1.863	22	6.945**	23	0.169		—

Note. DSM = Diagnostic and Statistical Manual of Mental Disorders; n = number of studies.

^aTest of the difference between effect size in each subgroup.

*p < .05. **p < .01.

a larger deficit in boys ($g = -0.179$, $p = .002$, 95% CI = [-0.290, -0.068]). Age group, $Q_{(17)} = 3.343$, $p = .188$, recruitment setting, $Q_{(21)} = 1.863$, $p = .394$, and DSM version, $Q_{(23)} = 0.169$, $p = .681$, used did not appear to have an influence.

A separate analysis of effect sizes by inhibition type, that is, motor response inhibition or interference control, revealed a sex difference only for the former, with boys presenting more difficulties ($g = -0.136$, $p = .020$, 95% CI = [-0.251, -0.021]).

Comparing Youths With and Without ADHD

When youths with ADHD were compared against those without, significant differences emerged between the two

groups on all the variables, in both girls and boys (see Table 4). However, when we compared the effect sizes for girls against those for boys, no significant difference was observed for any of the variables measured. In other words, boys and girls with ADHD presented significantly more primary symptoms and executive and attentional deficits than did their peers without ADHD, and effect sizes were not significantly different between the sexes.

Publication Bias

Egger's test raised the possibility of a publication bias in the studies that measured hyperactivity-impulsivity ($t = 2.296$, $p = .032$) and cognitive flexibility ($t = 3.194$, $p = .011$), whereas the rank correlation test raised the possibility of a

Table 4. Differences Between Youths With and Without ADHD, by Sex.

Domain	Samples included	n	Girls with and without ADHD		Boys with and without ADHD		Q value ^a
			Hedges's g	CI 95%	Hedges's g	95% CI	
Inattention	2, 4, 17, 31, 35, 36, 40, 42	8	-2.561***	[-3.261, -1.860]	-2.432***	[-3.102, -1.761]	0.068
Hyperactivity-impulsivity	2, 4, 17, 31, 35, 36, 40	7	-1.742***	[-2.182, -1.302]	-2.133***	[-2.554, -1.712]	1.585
Total symptoms	8, 23, 47	3	-2.485***	[-3.725, -1.245]	-3.165***	[-4.408, -1.923]	0.577
Inhibition	1, 16, 23, 24, 29, 31, 32, 35, 36, 39, 40, 42, 45	13	-0.577***	[-0.758, -0.395]	-0.516***	[-0.687, -0.345]	0.227
Motor response inhibition	1, 16, 23, 24, 29, 32, 35, 36, 39, 42	10	-0.488***	[-0.639, -0.337]	-0.410***	[-0.551, -0.268]	0.555
Interference control	1, 23, 31, 36, 40, 45	6	-0.502***	[-0.730, -0.275]	-0.566***	[-0.773, -0.359]	0.165
Working memory	5, 12, 23, 31, 35, 36, 37, 39, 40	9	-0.698***	[-1.054, -0.342]	-0.658***	[-1.004, -0.313]	0.024
Cognitive flexibility	1, 16, 24, 31, 36, 39, 40, 42, 45	9	-0.510***	[-0.727, -0.293]	-0.401***	[-0.607, -0.194]	0.510
Attention	1, 16, 35, 37	4	-0.482***	[-0.705, -0.260]	-.317**	[-0.531, -0.103]	1.103

Note. n = number of studies; CI = confidence interval.

^aTest of the difference between effect size for girls and effect size for boys.

* $p < .05$. ** $p < .01$. *** $p < .001$.

publication bias only for studies that measured hyperactivity-impulsivity ($\tau = 0.366$, $p = .012$). However, for all the other variables, the analyses revealed no potential publication bias. This suggested that the results of the present meta-analysis did not seem to be affected by a publication bias.

Discussion

The aim of this meta-analysis was to verify the presence of differences between boys and girls in terms of ADHD primary symptoms and of executive and attentional functioning. The main results show that boys with ADHD manifest more hyperactive behaviors and bigger inhibition and cognitive flexibility problems than girls with ADHD do. This meta-analysis confirms also that youths with ADHD present more primary symptoms of ADHD and more problems in terms of executive and attentional functions than do youths without ADHD, regardless of sex.

As for ADHD symptoms, boys with ADHD are more hyperactive than girls with ADHD are, which is consistent with results obtained in earlier meta-analyses (Gaub & Carlson, 1997; Gershon, 2002a). However, other sex differences emerge when effect sizes are compared by informant type (parent or teacher). Indeed, only according to teacher reports are boys more inattentive and hyperactive-impulsive than girls are. Various hypotheses might explain these results.

First, in replicating the results obtained by Abikoff et al. (1993), Jackson and King (2004) claimed that a halo effect was at play where teacher reports of ADHD symptoms were concerned. The authors demonstrated that the presence of oppositional behaviors increased the ADHD symptoms reported by teachers, but only for boys (Jackson & King, 2004). Thus, this tendency might potentially contribute to the sex difference observed, as boys with ADHD are more likely to manifest externalizing behaviors than girls with

ADHD are (Nussbaum, 2012). Teachers might also underestimate symptoms in girls, given that, compared with boys, their symptoms are less disruptive. Indeed, the demands of the school setting might underscore the more disruptive behaviors of boys, such as agitation or opposition, which are known to interfere with classroom management and student learning. Furthermore, contrary to parents, teachers are in contact with numerous children and are trained in child development. Thus, it may be easier for them to identify ADHD symptoms and, in turn, potential sex differences, given that they can more easily make comparisons against what is normally expected for children of the same age.

Regarding executive functions, results show a sex difference in inhibition, with boys demonstrating greater deficits than girls do. This is not consistent with previous meta-analysis by Gershon (2002a), who found no sex differences in tasks measuring inhibition. In our meta-analysis, the ADHD type of the participants included in the studies moderates this result. Indeed, studies that included youths with ADHD inattentive type were the ones to report a significant sex difference, rather than studies that included only youths with ADHD combined type. It has been argued that ADHD types are different disorders with different cognitive deficits (Barkley, 2005). Consequently, future studies would do well to specify ADHD type more clearly.

Comparing effect sizes by inhibition type examined shed some fresh light on the difference observed between boys and girls and could also explain, in part, the different results obtained. A significant difference emerges only on tasks measuring motor response inhibition, with boys exhibiting a larger deficit than girls do. This result is consistent with Hasson and Fine (2012), who found that boys made more errors of commission on the CPT than girls did. However, there is no difference where interference control is concerned.

In sum, our results suggest on the whole that the behavioral expression of ADHD symptoms differs by sex: Girls are less hyperactive and manifest less motor response inhibition difficulties. However, like boys, they are inattentive and have interference control problems. These results are important in that, on one hand, they underscore the fact that girls have symptoms that are more subtle and, consequently, less disruptive, which may undermine their chances of being referred clinically. These results thus support the idea to the effect that current diagnostic criteria are ill-adapted to properly screen girls with ADHD (Hinshaw & Blachman, 2005; Nadeau et al., 1999; Nussbaum, 2012; Ohan & Johnston, 2005; Quinn & Nadeau, 2002; Roberts et al., 2014). Indeed, the group of hyperactivity–impulsivity criteria comprises six items describing hyperactive behaviors and three items describing behaviors involving motor response inhibition. In light of these results, it seems that most of these criteria refer to behaviors more commonly manifested by and more easily noted in boys. This points to a serious limitation of the *DSM-5*, namely, that symptoms are not modulated according to sex. This constitutes a major obstacle when it comes to recognizing and diagnosing girls with ADHD, as it might be harder for girls to meet the hyperactivity–impulsivity diagnostic criteria. This could lead to a wrong diagnosis or to late diagnosis and, over time, to a worsening of symptoms (Dalsgaard et al., 2019; Ohan & Johnston, 2005; Quinn & Madhoo, 2014) and to associated problems, such as academic, social, and psychological difficulties (Bussing et al., 2010, 2012; Harpin et al., 2013). Moreover, the costs of the disorder over the long run cannot be neglected, as difficulties can persist into adulthood (Quinn & Madhoo, 2014). The long-term effects of untreated ADHD include problems regarding self-esteem (Harpin et al., 2013; Shaw et al., 2012), suicidal behaviors (Fitzgerald et al., 2019), psychotropic drug addiction (Shaw et al., 2012), social functioning (Harpin et al., 2013; Shaw et al., 2012), job performance (de Graaf et al., 2008; Shaw et al., 2012), and antisocial behaviors (Shaw et al., 2012). Also, it has been suggested that girls with ADHD may have higher relative premature deaths than boys with ADHD (Dalsgaard et al., 2014) and higher risk of developing schizophrenia (Díaz-Orueta et al., 2014). According to one study, women with untreated ADHD are at higher risk than men are of developing an affective, eating, or somatic disorder (Rasmussen & Levander, 2009).

Our study also shows that boys with ADHD have more cognitive flexibility problems than girls do. This could be explained by a later brain development in boys than in girls (Lenroot et al., 2007; Thompson et al., 2005), especially for later developing skills such as cognitive flexibility (O'Brien et al., 2010). However, working memory, planning, and attention deficits are just as common in boys as in girls. In other words, our results show that girls with ADHD have difficulties regarding executive and attentional functioning.

In sum, girls with ADHD do not differ from boys with ADHD in many domains of cognitive functioning and they have significantly more severe difficulties across the executive and attentional functions measured relative to girls without ADHD. This meta-analysis is the first to examine sex differences on cognitive flexibility, working memory, and planning.

Limitations and Future Research

Some of the methodological limitations of studies of sex differences in ADHD also apply to the results of our meta-analysis. For example, a large proportion of the samples considered were drawn from clinical settings (29 of 47 samples with participants exclusively from a clinical setting and nine of 47 samples with participants from both a clinical setting and the community). This poses a problem, in that, these samples are not representative of girls with ADHD, given that girls from clinical settings are those more severely affected by the disorder (Hinshaw, 2002; Rucklidge, 2010). In addition, using the *DSM* criteria (*IV*, *IV-TR*, or *5*) makes it harder to identify girls with ADHD, as these criteria were developed based on samples composed essentially of boys. As a result, girls recruited for research may be those who present a profile most like that of boys. This could limit the sex differences that might otherwise be observed in general-population samples. This notwithstanding, sex differences did emerge, and the results did not seem to be moderated by recruitment setting. However, this result must be interpreted with caution given the small number of studies that have recruited in the community. Consequently, to arrive at a more representative profile of youths with ADHD, it is essential that future studies draw more of their participants from the community.

Another limitation of this meta-analysis concerns the small number of studies found, as this restricts the interpretation of results for some variables or subgroups. Moreover, we managed to find only a few sources of heterogeneity in the results obtained. Other potential sources remain to be investigated, such as presence of concurrent disorders (e.g., anxiety), a potential moderator that could not be examined in our meta-analysis for lack of suitable data in the studies considered. The prevalence of disorders concurrent with ADHD was given at times, but no study presented specific results for groups of children with concurrent diagnoses. This did not allow us to examine differences between groups with and without concurrent disorders. It would have been worthwhile to assess the moderating effect of this variable given that concurrent disorders are common in youths with ADHD (APA, 2013), and some sex differences seem to exist in the prevalence of certain disorders. For example, it has been reported that boys are more likely to present externalizing problems and that girls are more likely to present internalizing problems (Biederman et al., 1999;

Hartung et al., 2002; Hinshaw, 2002; Quinn & Madhoo, 2014; Staller & Faraone, 2006; Zalecki & Hinshaw, 2004), a factor that could play a role in the manifestation, symptom severity, and treatment of ADHD. Indeed, a similar same sex difference is found in individuals without ADHD and it has been suggested that ADHD increases the relative risk of a comorbid anxiety more so in males than in females, both in children and adolescents (Ottosen et al., 2019) and in adults (Chen et al., 2018).

Cultural differences are another potential moderator that could have been explored. The majority of the samples in our meta-analysis came from North America (United States $n = 17$, Canada $n = 4$) or Europe ($n = 13$), with a minority from Asia ($n = 5$), Oceania ($n = 3$), South America ($n = 1$), or several countries ($n = 4$). It has been suggested that recognition of ADHD symptoms and referral of boys and girls with ADHD varied a lot between countries (Nøvik et al., 2006).

Yet another limitation of our meta-analysis lies in the fact that most of the studies considered included participants from different age groups (0–5, 6–11, 12–17). This made it difficult to compare subgroups. As it happens, several characteristics specific to the development in girls (e.g., earlier onset of puberty, hormones) might influence their behavioral and cognitive profile. The role of these characteristics needs to be examined in future research (Nussbaum, 2012; Quinn & Madhoo, 2014).

Future studies will need to focus special attention on how they report data with respect to age groups and concurrent disorders. Furthermore, it would be useful to verify the impact of characteristics specific to each sex, and to do so as a function of development. Other sources of heterogeneity might then come to the fore. It would also be worthwhile to verify whether other factors such as emotional regulation, social relations, self-esteem, and the development of coping strategies characterize the profile of girls with ADHD. These variables were identified by Quinn and Madhoo (2014) as potentially characteristic of girls with ADHD. With these data, we will be able to refine the behavioral, affective, and cognitive profile of girls with ADHD and thus facilitate their identification.

In summary, a different behavioral profile between boys and girls with ADHD is highlighted by our results. Boys exhibit more hyperactivity behaviors and greater difficulty in inhibiting a motor response. These results highlight that the current diagnostic criteria do not correspond to the behavioral expression of ADHD symptoms in girls. There is, therefore, still work to be done, in particular, to set up an evaluation process taking into account the specific characteristics of the girls' profile. Addressing the issue will then be a priority, so that health and school professionals can have good screening tools and can develop accurate knowledge to recognize and refer girls to ADHD, as well as help them to develop their full potential.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

Maryanne Loyer Carbonneau  <https://orcid.org/0000-0003-1788-5848>

Supplemental Material

Supplemental material for this article is available online.

References

- References marked with an asterisk indicate the studies included in the meta-analysis.
- Abikoff, H. B., Courtney, M., Pelham, W. E., & Koplewicz, H. S. (1993). Teachers' ratings of disruptive behaviors: The influence of halo effects. *Journal of Abnormal Child Psychology*, *21*(5), 159–533. <https://doi.org/10.1007/BF00916317>
- *Alford, J. L. (2007). *Inhibition in children with attention/deficit/hyperactivity disorder, combined type (ADHD+C): An examination of Barkley's hybrid model and Zentall's optimal stimulation model*. Pacific Graduate School of Psychology.
- American Psychiatric Association. (1968). *Diagnostic and statistical manual of mental disorders* (2nd ed.).
- American Psychiatric Association. (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed., Rev.).
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.).
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.).
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.
- Barkley, R. A. (2005). *ADHD and the nature of self-control*. Guilford Press.
- Begg, C. B., & Mazumdar, M. (1994). Operating characteristics of a rank correlation test for publication bias. *Biometrics*, *50*(4), 1088–1101.
- Biederman, J., Faraone, S. V., Mick, E., Williamson, S., Wilens, T. E., Spencer, T. J., . . . Zallen, B. (1999). Clinical correlates of ADHD in females: Findings from a large group of girls ascertained from pediatric and psychiatric referral sources. *Journal of the American Academy of Child & Adolescent Psychiatry*, *38*(8), 966–975. <https://doi.org/10.1097/00004583-199908000-00012>
- Biederman, J., Petty, C. R., Doyle, A. E., Spencer, T., Henderson, C. S., Marion, B., . . . Faraone, S. V. (2008). Stability of executive function deficits in girls with ADHD: A prospective longitudinal follow-up study into adolescence. *Developmental Neuropsychology*, *33*(1), 44–61. <https://doi.org/10.1080/87565640701729755>

- *Bilgiç, A., Toker, A., & Uysal, S. (2016). Exploratory study to evaluate plasma vasopressin and apelin-13 levels in children with attention-deficit hyperactivity disorder. *Psychiatry and Clinical Neurosciences*, *70*(10), 442–447.
- Borenstein, M., Hedges, L., Higgins, J., & Rothstein, H. (2013). *Comprehensive meta-analysis* (Version 3). Biostat.
- *Borschuk, A. P., Rodweller, C., & Salorio, C. F. (2018). The influence of comorbid asthma on the severity of symptoms in children with attention-deficit hyperactivity disorder. *The Journal of Asthma: Official Journal of the Association for the Care of Asthma*, *55*(1), 66–72. <https://doi.org/0.1080/02770903.2017.1306549>
- Bussing, R., Mason, D. M., Bell, L., Porter, P., & Garvan, C. (2010). Adolescent outcomes of childhood attention-deficit/hyperactivity disorder in a diverse community sample. *Journal of the American Academy of Child & Adolescent Psychiatry*, *49*(6), 595–605. <https://doi.org/10.1097/00004583-201006000-00008>
- Bussing, R., Porter, P., Zima, B. T., Mason, D., Garvan, C., & Reid, R. (2012). Academic outcome trajectories of students with ADHD: Does exceptional education status matter? *Journal of Emotional and Behavioral Disorders*, *20*(3), 131–143. <https://doi.org/10.1177/1063426610388180>
- *Chan, G. F., Lai, K. Y., Luk, E. S., Hung, S. F., & Leung, P. W. (2014). Clinical utility of the Chinese Strengths and Weaknesses of ADHD-Symptoms and Normal-Behaviors questionnaire (SWAN) when compared with DISC-IV. *Neuropsychiatric Disease and Treatment*, *10*, 1533–1542.
- *Chan, T., & Martinussen, R. (2016). Positive illusions? The accuracy of academic self-appraisals in adolescents with ADHD. *Journal of Pediatric Psychology*, *41*(7), 799–809.
- *Chen, M., Seipp, C. M., & Johnston, C. (2008). Mothers' and fathers' attributions and beliefs in families of girls and boys with attention-deficit/hyperactivity disorder. *Child Psychiatry & Human Development*, *39*(1), 85–99.
- Chen, Q., Hartman, C. A., Haavik, J., Harro, J., Klungsøyr, K., Hegvik, T.-A., . . . Larsson, H. (2018). Common psychiatric and metabolic comorbidity of adult attention-deficit/hyperactivity disorder: A population-based cross-sectional study. *PLoS ONE*, *13*(9), Article e0204516.
- *Cocchini, T., Crevani, A., Rossi, G., Assandri, F., Balottin, U., Nardo, R. D., & Manzo, L. (2009). Reduced platelet monoamine oxidase type B activity and lymphocyte muscarinic receptor binding in unmedicated children with attention deficit hyperactivity disorder. *Biomarkers*, *14*(7), 513–522.
- Conners, C. K. (1994). *CPT: Conner's Continuous Performance Test*. Multi-Health Systems.
- Conners, C. K. (1997). *Conner's Rating Scales-Revised: Technical Manual*. New York: Multi-Health Systems Inc.
- Dalsgaard, S., Mortensen, P. B., Frydenberg, M., Mailbing, C. M., Nordentoft, M., & Thomsen, P. H. (2014). Association between attention-deficit hyperactivity disorder in childhood and schizophrenia later in adulthood. *European Psychiatry*, *29*(4), 259–263.
- Dalsgaard, S., Ostergaard, S. O., Leckamm, J. F., Mortensen, P. B., & Pedersen, M. G. (2015). Mortality in children, adolescents, and adults with attention deficit hyperactivity disorder: A nationwide cohort study. *The Lancet*, *385*, 2190–2196.
- Dalsgaard, S., Thorsteinsson, E., Trabjerg, B. B., Schullehner, J., Plana-Ripoll Brikell, I., & Pedersen, C. B. (2019). Incidence rates and cumulative incidences of the full spectrum of diagnosed mental disorders in childhood and adolescence. *JAMA Psychiatry*, *77*, 155–164.
- Danielson, M. L., Bitsko, R. H., Ghandour, R. M., Holbrook, J. R., Kogan, M. D., & Blumberg, S. J. (2018). Prevalence of parent-reported ADHD diagnosis and associated treatment among U.S. children and adolescents, 2016. *Journal of Clinical Child & Adolescent Psychology*, *47*(2), 199–212.
- de Graaf, R., Kessler, R. C., Fayyad, J., ten Have, M., Alonso, J., Angermeyer, M., . . . Posada-Villa, J. (2008). The prevalence and effects of adult attention-deficit/hyperactivity disorder (ADHD) on the performance of workers: Results from the WHO World Mental Health Survey Initiative. *Occupational and Environmental Medicine*, *65*(12), 835–842. <https://doi.org/1136/oem.2007.038448>
- Delis, D., Kaplan, E., & Kramer, J. (2001). *Delis-Kaplan Executive Function Scale*. San Antonio: Texas: The Psychological Corporation.
- *Derks, E. M., Hudziak, J. J., Dolan, C. V., Ferdinand, R. F., & Boomsma, D. I. (2006). The relations between DISC-IV DSM diagnoses of ADHD and multi-informant CBCL-AP syndrome scores. *Comprehensive Psychiatry*, *47*(2), 116–122.
- *Díaz-Orueta, U., Garcia-Lopez, C., Crespo-Eguilaz, N., Sanchez-Carpintero, R., Climent, G., & Narbona, J. (2014). AULA virtual reality test as an attention measure: Convergent validity with Conners' Continuous Performance Test. *Child Neuropsychology*, *20*(3), 328–342.
- DuPaul, G. J., Anastopoulos, A. D., Power, T. J., Reid, R., Ikeda, M. J., & McGoey, K. E. (1998). Parent ratings of Attention-Deficit/Hyperactivity Disorder symptoms: Factor structure and normative data. *Journal of Psychopathology and Behavioral Assessment*, *20*, 83–102.
- *DuPaul, G. J., Jitendra, A. K., & Tresco, K. E. (2006). Children with attention deficit hyperactivity disorder: Are there gender differences in school functioning? *School Psychology Review*, *35*(2), 292–308.
- Egger, M., Davey Smith, G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a simple, graphical test. *British Medical Journal*, *315*, 629–634.
- *Elkins, I. J., Malone, S., Keyes, M., Iacono, W. G., & McGue, M. (2011). The impact of attention-deficit/hyperactivity disorder on preadolescent adjustment may be greater for girls than for boys. *Journal of Clinical Child & Adolescent Psychology*, *40*(4), 532–545.
- Fitzgerald, C., Dalsgaard, S., Nordentoft, M., & Erlangsen, A. (2019). Suicidal behavior among persons with attention-deficit hyperactivity disorder. *The British Journal of Psychiatry*, *215*, 615–620.
- *Gau, S. S., Chiu, C. D., Shang, C. Y., Cheng, A. T., & Soong, W. T. (2009). Executive function in adolescence among children with attention-deficit/hyperactivity disorder in Taiwan. *Journal of Developmental & Behavioral Pediatrics*, *30*(6), 525–534.
- Gaub, M., & Carlson, C. L. (1997). Gender differences in ADHD: A meta-analysis and critical review. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*(8), 1036–1045.
- Gershon, J. (2002a). Gender differences in AD/HD: An overview of research. In P. O. Quinn & K. G. Nadeau (Eds.), *Gender issues and AD/HD* (pp. 23–38). Advantages Books.

- Gershon, J. (2002b). A meta-analytic review of gender differences in ADHD. *Journal of Attention Disorders*, 5(3), 143–154.
- *Gökçe, S., Yusufoglu, C., Akin, E., & Ayaz, M. (2017). Effect of gender differences on impulsivity in adolescents with attention-deficit/hyperactivity disorder. *Anadolu Psikiyatri Dergisi*, 18(4), 379–386.
- *Graetz, B. W., Sawyer, M. G., & Baghurst, P. (2005). Gender differences among children with DSM-IV ADHD in Australia. *Journal of the American Academy of Child & Adolescent Psychiatry*, 44(2), 159–168.
- *Graetz, B. W., Sawyer, M. G., Baghurst, P., & Ettridge, K. (2006). Are ADHD gender patterns moderated by sample source? *Journal of Attention Disorders*, 10(1), 36–43.
- *Günther, T., Herpertz-Dahlmann, B., & Konrad, K. (2010). Sex differences in attentional performance and their modulation by methylphenidate in children with attention-deficit/hyperactivity disorder. *Journal of Child and Adolescent Psychopharmacology*, 20(3), 179–186.
- *Günther, T., Knospe, E. L., Herpertz-Dahlmann, B., & Konrad, K. (2015). Sex differences in attentional performance in a clinical sample with ADHD of the combined subtypes. *Journal of Attention Disorders*, 19(9), 764–770.
- Günther, T., Konrad, K., De Brito, S., Herpertz-Dahlmann, B., & Vloet, T. D. (2011). Attentional functions in children and adolescents with ADHD, depressive disorders, and the comorbid condition. *Journal of Child Psychology and Psychiatry*, 52(3), 324–331. <https://doi.org/10.1111/j.1469-7610.2010.02320.x>
- Harpin, V., Mazzone, L., Raynaud, J. P., Kahle, J., & Hodgkins, P. (2013). Long-term outcomes of ADHD: A systematic review of self-esteem and social function. *Journal of Attention Disorders*, 20(4), 295–305. <https://doi.org/10.1177/1087054713486516>
- *Hartung, C. M., Willcutt, E. G., Lahey, B. B., Pelham, W. E., Loney, J., Stein, M. A., & Keenan, K. (2002). Sex differences in young children who meet criteria for attention deficit hyperactivity disorder. *Journal of Clinical Child & Adolescent Psychology*, 31(4), 453–464. <https://doi.org/10.1207/153744202320802133>
- Hasson, R., & Fine, J. G. (2012). Gender differences among children with ADHD on continuous performance tests: A meta-analytic review. *Journal of Attention Disorders*, 16(3), 190–198. <https://doi.org/10.1177/1087054711427398>
- *Heckel, L., Clarke, A., Barry, R., McCarthy, R., & Selikowitz, M. (2009). The relationship between divorce and the psychological well-being of children with ADHD: Differences in age, gender, and subtype. *Emotional & Behavioural Difficulties*, 14(1), 49–68.
- Higgins, J. P. T., & Green, S. (2011). *Cochrane handbook for systematic reviews of interventions* (Version 5.1.0). www.handbook.cochrane.org
- Hinshaw, S. P. (2002). Preadolescent girls with attention-deficit/hyperactivity disorder: I. Background characteristics, comorbidity, cognitive and social functioning, and parenting practices. *Journal of Consulting and Clinical Psychology*, 70(5), 1086–1098. <https://doi.org/10.1037/0022-006X.70.5.1086>
- Hinshaw, S. P., & Blachman, D. R. (2005). Attention-deficit/hyperactivity disorder in girls. In D. J. Bell, S. L. Foster, & E. J. Mash (Eds.), *Handbook of behavioral and emotional problems in girls* (pp. 117–147). Kluwer Academic/Plenum
- Hinshaw, S. P., Carte, E. T., Fan, C., Jassy, J. S., & Owens, E. B. (2007). Neuropsychological functioning of girls with attention-deficit/hyperactivity disorder followed prospectively into adolescence: Evidence for continuing deficits? *Neuropsychology*, 21(2), 263–273. <https://doi.org/10.1037/0894-4105.21.2.263>
- Hinshaw, S. P., Carte, E. T., Sami, N., Treuting, J. J., & Zupan, B. A. (2002). Preadolescent girls with attention-deficit/hyperactivity disorder: II. Neuropsychological performance in relation to subtypes and individual classification. *Journal of Consulting and Clinical Psychology*, 70(5), 1099–1111. <https://doi.org/10.1037/0022-006X.70.5.1099>
- Houghton, S., Douglas, G., West, J., Whiting, K., Wall, M., Langsford, S., . . . Carroll, A. (1999). Differential patterns of executive function in children with attention-deficit hyperactivity disorder according to gender and subtype. *Journal of Child Neurology*, 14(12), 801–805.
- *Huang, Y. S., Wang, L. J., & Chen, C. K. (2012). Long-term neurocognitive effects of methylphenidate in patients with attention deficit hyperactivity disorder, even at drug-free status. *BMC Psychiatry*, 12, Article 194. <https://doi.org/10.1186/1471-244X-12-194>
- *Isaksson, J., Ruchkin, V., & Lindblad, F. (2016). Unseen and stressed? Gender differences in parent and teacher ratings of ADHD symptoms and associations with perceived stress in children with ADHD. *Journal of Attention Disorders*. <https://doi.org/10.1177/1087054716658381>
- Jackson, D. A., & King, A. R. (2004). Gender differences in the effects of oppositional behavior on teacher ratings of ADHD symptoms. *Journal of Abnormal Child Psychology*, 32(2), 215–224. <https://doi.org/0091-0627/04/0400-0215/0>
- Kagan, J. (1966). Reflection-impulsivity: The generality and dynamics of conceptual tempo. *Journal of Abnormal Psychology*, 71, 16–24.
- *Lahey, B. B., Hartung, C. M., Loney, J., Pelham, W. E., Chronis, A. M., & Lee, S. S. (2007). Are there sex differences in the predictive validity of DSM-IV ADHD among younger children? *Journal of Clinical Child & Adolescent Psychology*, 36(2), 113–126.
- *Lambek, R., Trillingsgaard, A., Kadesjo, B., Damm, D., & Thomsen, P. H. (2010). Gender differences on the Five to Fifteen questionnaire in a non-referred sample with inattention and hyperactivity-impulsivity and a clinic-referred sample with hyperkinetic disorder. *Scandinavian Journal of Psychology*, 51(6), 540–547. <https://doi.org/10.1111/j.1467-9450.2010.00825.x>
- Lenroot, R. K., Gogtay, N., Greenstein, D. K., Wells, E. M., Wallace, G. L., Clasen, L. S., . . . Giedd, J. N. (2007). Sexual dimorphism of brain developmental trajectories during childhood and adolescence. *NeuroImage*, 36, 1065–1073.
- *Lockwood, K. A., Marcotte, A. C., & Stern, C. (2001). Differentiation of attention-deficit/hyperactivity disorder subtypes: Application of a neuropsychological model of attention. *Journal of Clinical and Experimental Neuropsychology*, 23(3), 317–330.
- Madsen, K. B., Ravn, M. H., Arnfred, J., Olsen, J., Rask, C. U., & Obel, C. (2018). Characteristic of undiagnosed children with parent-reported ADHD behaviour. *European Child & Adolescent Psychiatry*, 27(2)149-158. <https://doi.org/10.1007/s00787-017-1029-4>

- *Mahone, E. M., Mostofsky, S. H., Lasker, A. G., Zee, D., & Denckla, M. B. (2009). Oculomotor anomalies in attention-deficit/hyperactivity disorder: Evidence for deficits in response preparation and inhibition. *Journal of the American Academy of Child & Adolescent Psychiatry*, 48(7), 749–756.
- *Martel, M. M. (2009). *Hormonal associations with childhood ADHD and associated trait and neuropsychological mechanisms*. Michigan State University.
- Martinussen, R., Hayden, J., Hogg-Johnson, S., & Tannock, J. (2005). A meta-analysis of working memory impairments in children with attention-deficit/hyperactivity disorder. *Journal of American Academy of Child & Adolescent Psychiatry*, 44(4), 377–384.
- *Mayfield, A. R., Parke, E. M., Barchard, K. A., Zenisek, R. P., Thaler, N. S., Etcoff, L. M., & Allen, D. N. (2016). Equivalence of mother and father ratings of ADHD in children. *Child Neuropsychology*, 24(2), 166–183. <https://doi.org/10.1080/09297049.2016.1236186>
- Miller, M., Loya, F., & Hinshaw, S. P. (2013). Executive functions in girls with and without childhood ADHD: Developmental trajectories and associations with symptom change. *Journal of Child Psychology and Psychiatry*, 54(9), 1005–1015. <https://doi.org/0.1111/jcpp.12074>
- *Montiel-Nava, C., Montiel-Barbero, I., & Peña, J. A. (2007). Clinical presentation of attention deficit/hyperactivity disorder as a function of the gender. *Investigacion Clinica*, 48(4), 459–468.
- *Muller, U. C., Asherson, P., Banaschewski, T., Buitelaar, J. K., Ebstein, R. P., Eisenberg, J., . . . Steinhausen, H. C. (2011a). The impact of study design and diagnostic approach in a large multi-centre ADHD study. Part 1: ADHD symptom patterns. *BMC Psychiatry*, 11(54). <https://doi.org/10.1186/1471-244X-11-54>
- *Muller, U. C., Asherson, P., Banaschewski, T., Buitelaar, J. K., Ebstein, R. P., Eisenberg, J., . . . Steinhausen, H. C. (2011b). The impact of study design and diagnostic approach in a large multi-centre ADHD study: Part 2: Dimensional measures of psychopathology and intelligence. *BMC Psychiatry*, 11, Article 55. <https://doi.org/10.1186/1471-244X-11-55>
- Nadeau, K. G., Littman, E. B., & Quinn, P. O. (1999). *Understanding girls with AD/HD: How they feel and why they do what they do*. Advantage Books.
- *Newcorn, J. H., Halperin, J. M., Jensen, P. S., Abikoff, H. B., Arnold, L. E., Cantwell, D. P., . . . Vitiello, B. (2001). Symptom profiles in children with ADHD: Effects of comorbidity and gender. *Journal of the American Academy of Child & Adolescent Psychiatry*, 40(2), 137–146.
- *Nigg, J. T., Blaskey, L. G., Huang-Pollock, C. L., & Rappley, M. D. (2002). Neuropsychological executive functions and DSM-IV ADHD subtypes. *Journal of the American Academy of Child & Adolescent Psychiatry*, 41(1), 59–66.
- *Nolan, E. E., Volpe, R. J., Gadow, K. D., & Sprafkin, J. (1999). Developmental, gender, and comorbidity differences in clinically referred children with ADHD. *Journal of Emotional and Behavioral Disorders*, 7(1), 11–20.
- Nøvik, T. S., Hervas, A., Ralston, S. J., Dalsgaard, S., Rodrigues Pereira, R., & Lorenzo, M. J. (2006). Influence of gender on attention-deficit/hyperactivity disorder in Europe—ADORE. *European Child & Adolescent Psychiatry*, 15(Suppl. 1), 5–24. <https://doi.org/10.1007/s00787-006-1003-z>
- Nussbaum, N. L. (2012). ADHD and female specific concerns: A review of the literature and clinical implications. *Journal of Attention Disorders*, 16(2), 87–100. <https://doi.org/10.1177/1087054711416909>
- *O'Brien, J. W., Dowell, L. R., Mostofsky, S. H., Denckla, M. B., & Mahone, E. M. (2010). Neuropsychological profile of executive function in girls with attention-deficit/hyperactivity disorder. *Archives of Clinical Neuropsychology*, 25(7), 656–670.
- Ohan, J., & Johnston, C. (2005). Gender appropriateness of symptom criteria for attention-deficit/hyperactivity disorder, oppositional-defiant disorder, and conduct disorder. *Child Psychiatry & Human Development*, 35(4), 359–381. <https://doi.org/10.1007/s10578-005-2694-y>
- *Øie, M., Hovik, K. T., Andersen, P. N., Czajkowski, N. O., & Skogli, E. W. (2016). Gender differences in the relationship between changes in ADHD symptoms, executive functions, and self- and parent-report depression symptoms in boys and girls with ADHD: A 2-year follow-up study. *Journal of Attention Disorders*, 22(5), 446–459.
- Otosen, C., Tidselbak, J., Faraone, S. V., Chen, Q., Hartman, C., Larsson, H., & Dalsgaard, S. (2019). Sex differences in comorbidity patterns of attention-deficit/hyperactivity disorder. *Journal of the American Child & Adolescent Psychiatry*, 58(4), 412–422.
- Organisation mondiale de la santé [OMS]. (2008). *Classification statistique internationale des maladies et des problèmes de santé connexes, Dixième Révision (CIM-10)*. Genève: Organisation mondiale de la Santé.
- *Prout, P. I. (2000). *Subtype and gender differences in attention-deficit/hyperactivity disorder: An investigation of selected neuropsychological variables*. University of Alberta.
- Quinn, P. O., & Madhoo, M. (2014). A review of attention-deficit/hyperactivity disorder in women and girls: Uncovering this hidden diagnosis. *The Primary Care Companion for CNS Disorders*, 16(3). <https://doi.org/10.4088/PCC.13r01596>
- Quinn, P. O., & Nadeau, K. G. (2002). Revisiting DSM-IV. In P. O. Quinn & K. G. Nadeau (Eds.), *Gender issues and AD/HD: Research, diagnosis and treatment* (pp. 82–107). Advantage Books.
- *Radonovich, K. J. (2000). *Gender differences on executive function tasks in children with ADHD*. University of Florida.
- Ramtekkar, U. P., Reiersen, A. M., Todorov, A. A., & Todd, R. D. (2010). Sex and age differences in attention-deficit/hyperactivity disorder symptoms and diagnoses: Implications for DSM-V and ICD-11. *Journal of the American Academy of Child & Adolescent Psychiatry*, 49(3), 217–228.
- Rasmussen, K., & Levander, S. (2009). Untreated ADHD in adults: Are there sex differences in symptoms, comorbidity, and impairment? *Journal of Attention Disorders*, 12(4), 353–360. <https://doi.org/10.1177/1087054708314621>
- *Riddle, M. A., Yershova, K., Lazzaretto, D., Paykina, N., Yenokyan, G., Greenhill, L., . . . Posner, K. (2013). The Preschool Attention-Deficit/Hyperactivity Disorder Treatment Study (PATS) 6-year follow-up. *Journal of the American Academy of Child & Adolescent Psychiatry*, 52(3), 264–278.

- Roberts, W., Milich, R., & Barkley, R. A. (2014). Primary symptoms, diagnostic criteria, subtyping, and prevalence of ADHD. In R. A. Barkley (Ed.), *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment* (pp. 51–80). Guilford Press.
- *Rosch, K. S., Dirlikov, B., & Mostofsky, S. H. (2015). Reduced intrasubject variability with reinforcement in boys, but not girls, with ADHD: Associations with prefrontal anatomy. *Biological Psychology, 110*, 12–23.
- *Rucklidge, J. J. (2006). Gender differences in neuropsychological functioning of New Zealand adolescents with and without attention deficit hyperactivity disorder. *International Journal of Disability, and Development and Education, 53*(1), 47–66.
- Rucklidge, J. J. (2010). Gender differences in attention-deficit/hyperactivity disorder. *Psychiatric Clinics of North America, 33*(2), 357–373. <https://doi.org/10.1016/j.psc.2010.01.006>
- *Rucklidge, J. J., & Tannock, R. (2001). Psychiatric, psychosocial, and cognitive functioning of female adolescents with ADHD. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*(5), 530–540. <https://doi.org/10.1097/00004583-200105000-00012>
- *Rucklidge, J. J., & Tannock, R. (2002). Neuropsychological profiles of adolescents with ADHD: Effects of reading difficulties and gender. *Journal of Child Psychology and Psychiatry, 43*(8), 988–1003. <https://doi.org/10.1111/1469-7610.00227>
- *Rumsey, R. K. (2004). *Executive functioning in boys and girls with attention-deficit/hyperactivity disorder with and without a comorbid reading disability*. University of Wisconsin.
- Seidman, L. J., Biederman, J., Monuteaux, M. C., Valera, E., Doyle, A. E., & Faraone, S. V. (2005). Impact of gender and age on executive functioning: Do girls and boys with and without attention deficit hyperactivity disorder differ neuropsychologically in preteen and teenage years? *Developmental Neuropsychology, 27*(1), 79–105. https://doi.org/10.1207/s15326942dn2701_4
- Sergeant, J. A., Geurts, H., & Oosterlaan, J. (2002). How specific is a deficit of executive functioning for attention-deficit/hyperactivity disorder? *Behavioural Brain Research, 130*(1–2), 3–28. [https://doi.org/10.1016/S0166-4328\(01\)00430-2](https://doi.org/10.1016/S0166-4328(01)00430-2)
- *Seymour, K. E., Mostofsky, S. H., & Rosch, K. S. (2016). Cognitive load differentially impacts response control in girls and boys with ADHD. *Journal of Abnormal Child Psychology, 44*(1), 141–154.
- Shallice, T., Marzocchi, G. M., Coser, S., Del Savio, M., Meuter, R. F., & Rumiat, R. I. (2002). Executive function profile of children with attention deficit hyperactivity disorder. *Developmental Neuropsychology, 21*(1), 43–71. https://doi.org/10.1207/S15326942DN2101_3
- Shaw, M., Hodgkins, P., Caci, H., Young, S., Kahle, J., Woods, A. G., & Arnold, L. E. (2012). A systematic review and analysis of long-term outcomes in attention deficit hyperactivity disorder: Effects of treatment and non-treatment. *BMC Medicine, 10*, Article 99. <https://doi.org/10.1186/1741-7015-10-99>
- *Sjöwall, D., Roth, L., Lindqvist, S., & Thorell, L. B. (2013). Multiple deficits in ADHD: Executive dysfunction, delay aversion, reaction time variability, and emotional deficits. *Journal of Child Psychology and Psychiatry, 54*(6), 619–627.
- *Skogli, E. W., Teicher, M. H., Andersen, P. N., Hovik, K. T., & Øie, M. (2013). ADHD in girls and boys—Gender differences in co-existing symptoms and executive function measures. *BMC Psychiatry, 13*, Article 298. <https://doi.org/10.1186/1471-244X-13-298>
- *Sonuga-Barke, J. S., Coghill, D., Markowitz, J. S., Swanson, J. M., Vandenbergh, M., & Hatch, S. J. (2007). Sex differences in the response of children with ADHD to once-daily formulations of methylphenidate. *Journal of the American Academy of Child & Adolescent Psychiatry, 46*(6), 701–710.
- *Sonuga-Barke, J. S., & Rubia, K. (2008). Inattentive/overactive children with histories of profound institutional deprivation compared with standard ADHD cases: A brief report. *Child: Care, and Health and Development, 34*(5), 596–602.
- Spronk, M., Jonkman, L. M., & Kemner, C. (2008). Response inhibition and attention processing in 5- to 7-year-old children with and without symptoms of ADHD: An ERP study. *Clinical Neurophysiology, 119*(12), 2738–2752. <https://doi.org/10.1016/j.clinph.2008.09.010>
- Staller, J., & Faraone, S. V. (2006). Attention-deficit hyperactivity disorder in girls: Epidemiology and management. *CNS Drugs, 20*(2), 107–123. <https://doi.org/10.2165/00023210-200620020-00003>
- Stroop, J. P. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology, 18*, 643–662.
- Thompson, P. M., Sowell, E. R., Gogtay, N., Giedd, J. N., Vidal, C. N., Hayashi, K. M., . . . Toga, A. W. (2005). Structural MRI and brain development. *International Review of Neurobiology, 67*, 285–323.
- *Wang, L. J., Chen, C. K., & Huang, Y. (2015). Gender differences in the behavioral symptoms and neuropsychological performance of patients with attention-deficit/hyperactivity disorder treated with methylphenidate: A two-year follow-up study. *Journal of Child and Adolescent Psychopharmacology, 25*(6), 501–508.
- *Wehmeier, P. M., Schacht, A., Escobar, R., Hervas, A., & Dickson, R. (2012). Health-related quality of life in ADHD: A pooled analysis of gender differences in five atomoxetine trials. *ADHD Attention Deficit and Hyperactivity Disorders, 4*(1), 25–35.
- Willcutt, E. G., Doyle, A. E., Nigg, J. T., Faraone, S. V., & Pennington, B. F. (2005). Validity of the executive function theory of attention-deficit/hyperactivity disorder: A meta-analytic review. *Biological Psychiatry, 57*(11), 1336–1346.
- *Wodka, E. L., Loftis, C., Mostofsky, S. H., Prahme, C., Gidley Larson, J. C., Denckla, M. B., & Mahone, E. M. (2008). Prediction of ADHD in boys and girls using the D-KEFS. *Archives of Clinical Neuropsychology, 23*(3), 283–293. <https://doi.org/10.1016/j.acn.2007.12.004>
- *Wodka, E. L., Mahone, E. M., Blankner, J. G., Gidley Larson, J. C., Fotedar, S., Denckla, M. B., & Mostofsky, S. H. (2007). Evidence that response inhibition is a primary deficit in ADHD. *Journal of Clinical and Experimental Neuropsychology, 29*(4), 345–356.
- *Yang, P., Jong, Y. J., Chung, L. C., & Chen, C. S. (2004). Gender differences in a clinic-referred sample of Taiwanese attention-deficit/hyperactivity disorder children. *Psychiatry and Clinical Neurosciences, 58*(6), 619–623.
- Zalecki, C. A., & Hinshaw, S. P. (2004). Overt and relational aggression in girls with attention deficit hyperactivity disorder.

Journal of Clinical Child & Adolescent Psychology, 33(1), 125–137. https://doi.org/10.1207/S15374424JCCP3301_12

*Zhou, J. Y., Yi, M. J., Kuang, G. F., & Fu, P. (2006). Clinical features and behavior characteristics of children with attention deficit hyperactivity disorder at various intelligence levels. *Chinese Journal of Clinical Rehabilitation*, 10(46), 12–15.

Author Biographies

Maryanne Loyer Carbonneau is a clinical psychologist working with kids, adolescents and families. She earned her doctorate in psychology in 2019 from the Université du Québec à Montréal. The main objective of her work was to better understand the profile of girls with ADHD.

Martin Demers is a doctoral candidate in psychology at the Université du Québec à Montréal. His research interests are psychometrics, applied statistics and parenting, with parenting stress as a main focus.

Marc Bigras is a professor in the Psychology Department at the Université du Québec à Montréal. His teaching and research focuses on the condition that promotes young children's adjustment to school, taking into account their personal characteristics, the quality of family relationship and preschool programs.

Marie-Claude Guay is a neuropsychologist and professor in the Psychology Department at the Université du Québec à Montréal. She is also an associate researcher at the Centre Jeunesse de Montréal - Institut universitaire.