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Establishing a Link Between Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder and Childhood Physical Abuse

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Attention deficit disorder and attention deficit/hyperactivity disorders (ADD/ADHD) are found in approximately 5% to 10% of school-aged children. This study examined whether childhood physical abuse was associated with ADD/ADHD. Data were derived from a population-based sample of 13,054 adults from the 2005 Canadian Community Health Survey. We used logistical regression analysis in 2 models, both of which had ADD/ADHD as the criterion variable. There were 7 times higher odds of ADD/ADHD among those who reported they had been abused after controlling for several potential mediating factors, including age, race, gender, and 3 other types of adverse childhood experiences (parental divorce, parental addictions, and long-term parental unemployment) in comparison to those who were not abused. The results of this analysis show a strong link between childhood abuse and ADD/ADHD, an association that requires further study.

KEYWORDS adult survivors of child abuse, attention deficit disorders, attention deficit disorders with hyperactivity, attention deficit hyperactivity disorders, child abuse, child maltreatment

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Attention deficit disorder (ADD) and attention deficit/hyperactivity disorder (ADHD) are common neurobiological disorders prevalent in childhood. ADD exists in three forms, namely inattentive type (AD), hyperactive-impulsive type (HI), and combined type (CT; Wolraich, Hannah, Pinnock, & Baumgaertel, 1996). In survey-based epidemiological studies conducted in Tennessee and Germany, the prevalence rates for ADD involving primarily inattention, primarily hyperactivity, and a combined type ranged from 4.7% to 9.0%, 3.4% and 3.9%, and 4.4% to 4.8%, respectively (Wolraich & Baumgaertel, 1996; Wolraich et al., 1996). In childhood, ADD leads to a wide range of short-term consequences in the social and academic realm (Lahey & Leober, 1997). Symptoms of ADD and ADHD often persist into adolescence and adulthood, with up to 80% of children experiencing them beyond childhood (Brown, 2000). Some effects include lower occupational status, lower income levels, and lower job retention (Becker & McCloskey, 2002; Daley, 2003). Individuals with ADD/ADHD often experience difficulties in social relationships and face higher rates of divorce (Faraone, Sergeant, Gillberg, & Biederman, 2003; Litner, 2003). Those with ADD/ADHD are twice as likely to be involved in crime and substance abuse as compared to their peers without the disorder (Litner, 2003). Adults with ADHD are particularly vulnerable to comorbid depression, anxiety, and bipolar disorder (Kennemer & Goldstein, 2010).

Elevated rates of physical abuse have been observed among those with ADD and ADHD. Briscoe-Smith and Hinshaw (2006) found that girls with ADHD were more likely to have experienced physical and sexual abuse when compared to their peers without ADHD. Furthermore, girls with ADHD with a history of abuse also had more aggressive externalizing behaviors than a comparison group of girls with ADHD but no history of abuse. Ford et al. (2000) found those with ADHD were more likely to have experienced physical maltreatment when contrasted to children with adjustment disorders. A recent secondary analysis of more than 14,000 respondents to the National Longitudinal Study of Adolescent Health concluded that children with ADHD symptoms have 39% higher odds of physical abuse in comparison to their peers without ADHD (Ouyang, Fang, Mercy, Perou, & Grosse, 2008).

Childhood physical abuse and ADHD/ADD share many of the same risk factors. The prevalence of childhood physical abuse is higher among children who experience long-term parental unemployment, parental divorce, and parental addictions (Fuller-Thomson & Sawyer, 2014). Similarly, ADHD is more prevalent among those experiencing childhood adversities, including high levels of poverty, parental discord (Ouyang et al., 2008), and parental divorce (Briscoe-Hinshaw & Smith, 2006). The prevalence of addiction problems is higher in parents of children with ADHD (Wilens, Biederman, Mick, Faraone, & Spencer, 1997). Sociodemographic factors associated with childhood maltreatment include race, ethnicity (Ouyang et al., 2008), gender, and age (Fuller-Thomson & Sawyer, 2014). Therefore, it is important to control
for these characteristics to more fully understand the independent association between childhood physical abuse and ADHD/ADD.

Several authors have hypothesized that difficult behaviors common to children with ADHD and ADD make them more vulnerable to abuse by parents and caretakers as a means to combat difficult temperaments, aggression, and ensuing misbehavior (Briscoe-Hinshaw & Smith, 2006; Litner, 2003). A lack of understanding about ADD/ADHD leads many parents to doubt the legitimacy of these disorders, deeming the children lazy or incompetent instead (Olaniyan et al., 2007). Difficult childhood temperaments and behaviors might alienate the friends of parents and other members of the parents’ social support networks, thereby leading to greater parental isolation (Podolski & Nigg, 2001). In turn, parents with lower levels of social support are more likely to maltreat their children out of frustration and due to a lack of support (Olaniyan et al., 2007; Podolski & Nigg, 2001).

It is possible that genetic factors play a role in the relationship between physical abuse and ADD/ADHD. Studies have shown that elements of ADHD are inherited and children of parents with ADHD are more likely to be diagnosed similarly (Thapar, Langley, Owen, & O’Donovan, 2007). Parents who suffer from ADHD are more vulnerable to marital breakdown (Murphy & Barkley, 1996). Parents with ADHD are also more likely to have problems maintaining steady employment (Murphy & Barkley, 1996) and to be poor (Stavro, Ettenhofer, & Nigg, 2007). Parental poverty is an independent risk factor for abuse (Drake & Pandey, 1996). Furthermore, some parents with ADHD have higher levels of impulsivity and lower emotional regulation, which could lead to lower levels of patience and angry outbursts (Surman et al., 2011) with potentially negative consequences for their children. In combination, these risk factors might explain the increased likelihood of abuse faced by children with ADD and ADHD. Therefore, the home environment of children with ADD/ADHD who have parents with the condition might be more volatile and violent.

It is also possible that childhood abuse could induce or exacerbate ADD/ADHD symptoms through the influence of maltreatment on brain development, including brain volume and the amygdala. A study using MRI scans found maltreated children and adolescents who also suffered from posttraumatic stress disorder (PTSD) had intracranial and cerebral volumes that were 7.0% and 8.0% smaller, respectively, than matched controls who had not been maltreated (De Bellis et al., 1999). Brain volume was negatively associated with the duration of the abuse (De Bellis et al., 1999). In comparison, in a large anatomic MRI study of children, Castellanos et al. (2002) showed that those with ADHD have approximately a 3% reduction in overall brain volume in comparison to children without ADHD.

In the brain, the amygdala evaluates whether a situation is potentially threatening and contributes to emotional processing and memory (McCrory, De Brito, & Viding, 2012). In studies of previously institutionalized children
Linking ADD/ADHD to Childhood Physical Abuse

(i.e., reared in orphanages) in comparison to noninstitutionalized matched controls, the size of the amygdala was significantly enlarged (Tottenham et al., 2009) and the amygdala’s response to threatening cues was greater (Tottenham et al., 2011).

As might be expected among those growing up in threatening environments, maltreated children show hypervigilance to nonverbal clues such as threatening faces, which might “be at the cost of other developmental processes” (McCorry et al., 2012, p. 153). It is difficult to focus on learning and other tasks when one’s attention is concentrated on scanning for potential threats in the environment. Furthermore, hyperarousal in abused children is negatively associated with brain volume (De Bellis et al., 1999). A number of studies point to a range of negative short- and long-term outcomes in those who are abused as children. In addition to the immediate physical and health implications of abuse, psychosocial, academic, social functioning, and mental well-being are negatively impacted throughout childhood, adolescence, and into adulthood (Felitti et al., 1998; Fuller-Thomson & Brennenstuhl, 2009; Fuller-Thomson, Brennenstuhl, & Frank, 2010; Ireland, Smith, & Thornberry, 2002).

Although comorbid childhood abuse and ADD/ADHD have not been extensively studied, the nascent literature suggests that individuals with ADD/ADHD who have been abused have much higher levels of externalizing behaviors, aggression, and peer rejection than those with ADHD who have no abuse history (Briscoe-Hinshaw & Smith, 2006). Previous research, although helpful in exploring the association between childhood physical abuse and ADD/ADHD, has been limited by relatively small sample sizes (Briscoe-Hinshaw & Smith, 2006; Brown, 1996; Ford et al., 2000), an over-reliance on clinical as opposed to representative community samples (Ford et al., 2000; Olaniyan et al., 2007), and an inability to control for other adverse childhood experiences such as low childhood socioeconomic status, parental divorce, and parental addictions (Briscoe-Smith & Hinshaw, 2006; Ford et al., 2000; Ouyang et al., 2008).

METHOD

Data Source and Sample

We conducted a secondary analysis of data from respondents 18 years and older from the Saskatchewan and Manitoba sample of the 2005 Canadian Community Health Survey (CCHS). The combined response rate for Manitoba and Saskatchewan was 84%. The CCHS is a nationally representative cross-sectional survey that collects information about the Canadian population with regard to health status, health care utilization, and health determinants (Statistics Canada, 2007). Of the 13,640 respondents in Saskatchewan and Manitoba who were aged 18 and older, 538 were missing information...
on only the physical abuse question, 39 were missing information on only the ADHD/ADD question, and 9 were missing information on both questions. Thus, the final unweighted sample size for the cross-tabs was 13,054. Of these, 1,020 respondents reported abuse and 64 respondents reported either ADHD or ADD.

Statistical Analysis
We conducted two logistical regression analyses using ADD/ADHD as the criterion variable. In our first model, we included childhood physical abuse, age, gender, and race. In the subsequent model, we included these factors in addition to three other adverse childhood experiences, namely childhood parental divorce, childhood parental addictions, and long-term parental unemployment. Due to missing data for the control variables, the sample sizes varied from \( n = 13,054 \) in the first model to \( n = 12,750 \) in the fully adjusted model.

Measures
In the CCHS, the question on ADHD/ADD came after the following preamble: “Now I’d like to ask about certain chronic health conditions which you may have. We are interested in ‘long-term conditions’ which are expected to last or have already lasted 6 months or more and that have been diagnosed by a health professional.” In the list of chronic conditions that followed, the respondent was asked about ADD and ADHD.

Adverse childhood experiences in this study included childhood physical abuse, parental divorce, parental addictions, and long-term parental unemployment.

**Childhood Abuse**

Childhood physical abuse was assessed in a section of the CCHS that asks questions about several adverse childhood experiences. The following instructions prefaced this section: “The next few questions ask about some things that may have happened to you while you were a child or a teenager, before you moved out of the house.” If adults responded, “yes” to the question “Were you ever physically abused by someone close to you?” they were classified as physically abused during childhood.

**Other Adverse Childhood Experiences**

The three other childhood stressors of interest were assessed in the same section of the survey, as follows: (a) parental divorce: “Did your parents get
a divorce?"; (b) parental unemployment: “Did your father or mother not have a job for a long time when they wanted to be working?” and (c) parental addictions: “Did either of your parents drink or use drugs so often that it caused problems for the family?”

DEMOGRAPHIC CHARACTERISTICS

Demographic control variables investigated included age (18–29 and then by decade to 80 years and older), sex, and self-reported race (White and visible minority).

RESULTS

We found a strong and significant association between childhood physical abuse and self-report of a health care professional’s diagnosis of ADD/ADHD (see Table 1). Only 7.2% of those without ADD/ADHD reported childhood physical abuse, in sharp contrast to 29.6% of those with ADD/ADHD. As shown in Table 2, the age, sex, and race adjusted odds of ADD/ADHD were more than six times higher for those who had been physically abused in comparison to their nonabused peers (OR = 6.56; 95% CI [4.003, 10.74]). When further adjustments were made for other adverse childhood experiences (parental divorce, parental addictions, and long-term parental unemployment), the odds of ADD/ADHD for those who had been physically abused increased to greater than seven times (OR = 7.64; 95% CI [4.38, 13.3]) that of nonabused respondents. In the fully adjusted model, males had two times the odds of ADD/ADHD (OR = 2.09, 95% CI [1.32, 3.30]) and greater age was associated with lower odds of ADD/ADHD (OR = 0.90, 95% CI [0.88, 0.92]). Race, parental divorce, parental addictions, and parental long-term unemployment were not significantly associated with ADD/ADHD.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Self-Reported Childhood Physical Abuse by Self-Report of a Diagnosis by a Health Professional of Attention Deficit Hyperactive Disorder (ADHD) or Attention Deficit Disorder (ADD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physically abused as a child</td>
<td>Sample size (unweighted)</td>
</tr>
<tr>
<td>Not abused</td>
<td>12,034</td>
</tr>
<tr>
<td>Abused</td>
<td>1,020</td>
</tr>
</tbody>
</table>

Note. Sample: Canadian Community Health Survey 3.1 respondents aged 18 and over in Manitoba and Saskatchewan (unweighted sample size = 13,054).

*p < .001.
TABLE 2 Logistic Regression of Factors Associated with Self-report of a Diagnosis by a Health Professional of Attention Deficit Hyperactive Disorder or Attention Deficit Disorder

<table>
<thead>
<tr>
<th>Variable</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>Odds ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.12</td>
<td>0.13</td>
<td>0.13</td>
<td></td>
</tr>
<tr>
<td>Physically abused as a child</td>
<td>6.56</td>
<td>[4.00, 10.74]</td>
<td>7.64</td>
<td>[4.38, 13.33]</td>
</tr>
<tr>
<td>Not physically abused</td>
<td>1.00</td>
<td>Ref</td>
<td>1.00</td>
<td>Ref</td>
</tr>
<tr>
<td>Male</td>
<td>2.07</td>
<td>[1.31, 3.28]</td>
<td>2.09</td>
<td>[1.32, 3.30]</td>
</tr>
<tr>
<td>Female</td>
<td>1.00</td>
<td>Ref</td>
<td>1.00</td>
<td>Ref</td>
</tr>
<tr>
<td>Age in years</td>
<td>0.90</td>
<td>[.88, .92]</td>
<td>0.90</td>
<td>[.88, .92]</td>
</tr>
<tr>
<td>White</td>
<td>0.96</td>
<td>[.56, 1.65]</td>
<td>0.96</td>
<td>[.56, 1.64]</td>
</tr>
<tr>
<td>Visible minority</td>
<td>1.00</td>
<td>Ref</td>
<td>1.00</td>
<td>Ref</td>
</tr>
<tr>
<td>Parental divorce</td>
<td>0.70</td>
<td>[.38, 1.28]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No parental divorce</td>
<td>1.00</td>
<td>Ref</td>
<td>1.00</td>
<td>Ref</td>
</tr>
<tr>
<td>Parental addiction</td>
<td>0.85</td>
<td>[.44, 1.61]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No parental addiction</td>
<td>1.00</td>
<td>Ref</td>
<td>1.00</td>
<td>Ref</td>
</tr>
<tr>
<td>Parental unemployment</td>
<td>0.96</td>
<td>[.51, 1.80]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No parental unemployment</td>
<td>1.00</td>
<td>Ref</td>
<td>1.00</td>
<td>Ref</td>
</tr>
</tbody>
</table>

Note: Unweighted sample size = 12,750.

DISCUSSION

This study found a strong and robust association between childhood physical abuse and ADD/ADHD when controlling for age, race, and adverse childhood experiences including childhood parental divorce, parental addictions, and long-term parental unemployment. Due to the retrospective nature of the CCHS data, the temporal order of the abuse–ADD/ADHD association cannot be established. It is possible that ADD/ADHD preceded the abuse or that the abuse preceded the development of ADD/ADHD.

In support of the former pathway, ADD/ADHD might place children at increased risk of abuse due to their erratic behavior, which could result in strong corporal punishment. Furthermore, if one or both of the parents also have ADHD, the parents’ poor impulse control might increase their likelihood of physically abusing their children.

In contrast, childhood physical abuse might increase the likelihood of the development of ADD or ADHD. Becker and McCloskey (2002) suggested that early childhood abuse results in and exacerbates the risk of induced ADHD and ADD. Research suggests that a strong link exists between PTSD and ADHD, both of which are common among children who have experienced physical abuse (Ford et al., 2000; King, Barkley, & Barrett, 1998).

Research with children who have experienced maltreatment shows that these experiences increase the likelihood of developing PTSD (Dannlowski et al., 2012). Many of the symptoms of PTSD, such as hypervigilance and an inability to concentrate, overlap substantially with those of ADD/ADHD. Other research suggests that hyperresponsiveness in the amygdala could be a possible mediator between experiences of childhood adversity, such as
abuse, and disorders such as PTSD and ADHD (Dannlowski et al., 2012). Smaller brain sizes have also been noted among children experiencing ADHD (Castellanos et al., 2002) and maltreated children with PTSD (De Bellis et al., 1999). More extensive research is needed to ascertain the independent impact of ADHD and of abuse on brain development.

New research underlines the importance of considering genetic risks for ADHD in the context of environmental challenges in childhood and adolescence. Laucht et al. (2007) found a gene-by-environment interaction such that a polymorphism in a gene associated with the dopamine transporter (DAT1) appeared to put adolescents at greater risk for ADHD primarily when the youth had grown up in greater psychosocial adversity. Adolescents with the polymorphism who grew up in less adverse environments and those without the polymorphism had a significantly lower prevalence of inattention and hyperactivity-impulsivity. Thus, it appears that early adversity might moderate the impact of genetic susceptibility to ADHD. Because it is well-known that childhood abuse impacts the developing brain, research focused on neurology and ADD/ADHD should gather information on the maltreatment history of all subjects. As this representative study of community dwellers suggests, it is possible that approximately one third of subjects with ADHD/ADD might have also been exposed to abuse.

This study indicates a link between environmental deprivation and ADD/ADHD. This study underlines the need for further investigation of the temporal order of the association and potential pathways, which could explain the association between ADD/ADHD and abuse through the use of prospective research. This study also found that males had two times higher odds of ADD/ADHD, which aligns with previous literature (Bryant, 2005). In contrast to studies in the United States (e.g., Gingerich, Turnock, Litfin, & Rosen, 1998), this population-based Canadian study did not find that visible minority status was associated with ADD/ADHD.

CONCLUSION

The results of this study show the odds of ADD/ADHD are sixfold greater for those who report they were physically abused in childhood compared to those who were not, even after controlling for several potential mediating factors including demographics and other adverse childhood experiences. The retrospective nature of the data made it impossible to determine causation or the temporal order of the association. Future research, ideally with prospective, population-based samples of children and youth, is needed to verify if ADD/ADHD and physical abuse are correlated in other studies and the mechanisms through which this occurs. If the ADD/ADHD link to child abuse is validated in future studies, these findings might inform policy in
the areas of child protection and primary health care services to improve targeted screening for child abuse among those with ADD/ADHD.

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