

2009

Television content and attention deficit/ hyperactivity disorder (ADHD) symptoms: Testing the relationship on preschoolers

Bojana Knezevic
University of Windsor

Follow this and additional works at: <http://scholar.uwindsor.ca/etd>

Recommended Citation

Knezevic, Bojana, "Television content and attention deficit/hyperactivity disorder (ADHD) symptoms: Testing the relationship on preschoolers" (2009). *Electronic Theses and Dissertations*. Paper 36.

This online database contains the full-text of PhD dissertations and Masters' theses of University of Windsor students from 1954 forward. These documents are made available for personal study and research purposes only, in accordance with the Canadian Copyright Act and the Creative Commons license—CC BY-NC-ND (Attribution, Non-Commercial, No Derivative Works). Under this license, works must always be attributed to the copyright holder (original author), cannot be used for any commercial purposes, and may not be altered. Any other use would require the permission of the copyright holder. Students may inquire about withdrawing their dissertation and/or thesis from this database. For additional inquiries, please contact the repository administrator via email (scholarship@uwindsor.ca) or by telephone at 519-253-3000ext. 3208.

TELEVISION CONTENT AND ATTENTION DEFICIT/HYPERACTIVITY
DISORDER (ADHD) SYMPTOMS: TESTING THE RELATIONSHIP IN
PRESCHOOLERS

by

Bojana Knezevic

A Thesis
Submitted to the Faculty of Graduate Studies
through the Department of Psychology
in Partial Fulfillment of the Requirements for
the Degree of Master of Arts at the
University of Windsor

Windsor, Ontario, Canada

2009

© 2009 Bojana Knezevic

Author's Declaration of Originality

I hereby certify that I am the sole author of this thesis and that no part of this thesis has been published or submitted for publication.

I certify that, to the best of my knowledge, my thesis does not infringe upon anyone's copyright nor violate any proprietary rights and that any ideas, techniques, quotations, or any other material from the work of other people included in my thesis, published or otherwise, are fully acknowledged in accordance with the standard referencing practices. Furthermore, to the extent that I have included copyrighted material that surpasses the bounds of fair dealing within the meaning of the Canada Copyright Act, I certify that I have obtained a written permission from the copyright owner(s) to include such material(s) in my thesis and have included copies of such copyright clearances to my appendix.

I declare that this is a true copy of my thesis, including any final revisions, as approved by my thesis committee and the Graduate Studies office, and that this thesis has not been submitted for a higher degree to any other University or Institution.

Abstract

The present study examined the role that the violent television plays in the manifestation of Attention Deficit/Hyperactivity Disorder (ADHD) symptoms in a Canadian sample of preschool-aged children. The parents of preschool-aged children at increased risk ($n = 8$) and low risk ($n = 25$) for ADHD provided information about their child's television viewing patterns and favourite programs. Separate ANOVAs were used to evaluate the relationship between the group status and the amount of television viewing per day and the level of violence in their preferred television program. Results indicated that television exposure is not significantly related to the manifestation of ADHD symptoms in a Canadian sample of preschool-aged children. These findings partially replicate those from a recent study indicating lack of correlation between television exposure and ADHD associated behaviours in children at-risk of ADHD. However, further research should be conducted with a larger sample size.

Acknowledgments

I would like to express my gratitude to various people who helped me along this journey. First, my overwhelming respect and thanks goes to Dr. Carlin Miller for her invaluable advice, resourcefulness, guidance, and numerous hours invested in making me a better researcher. Second, a special thanks to Vilija Petrauskas for editing my work and Andrea Kapeleris for providing me with positive energy and humour when it was hard to go on.

I would like to express my appreciation to friends and family in Windsor, Toronto and across the ocean for always being there, every step of the way. Specifically, to Mom, thank you for all the warm meals filled with love and energy to keep on writing. To my brother, thank you for keeping my computer alive and allowing me to practice presenting over the phone.

In addition, I would like to extend my gratitude to the families who participated in the study, for their interest and invested time.

Finally, to my Dad, thank you for inspiring me. Your belief in me gave me strength to make it happen.

TABLE OF CONTENTS

AUTHOR'S DECLARATION OF ORIGINALITY	iii
ABSTRACT	iv
ACKNOWLEDGMENTS	v
LIST OF TABLES	ix
CHAPTER	
I. INTRODUCTION	
Objectives	1
II. LITERATURE REVIEW	
Organization of Review	3
The Nature of ADHD	3
Underlying Biology of ADHD	6
Genetics of ADHD	6
Neuroanatomical Structure and Function of ADHD	9
ADHD During the Preschool Years	11
Typical Preschool Behaviour	11
Preschoolers at-risk for ADHD	12
Parent and Teacher Reports About Preschoolers	
At-risk of ADHD	14
Persistence of ADHD Symptoms	16
Parenting Practices and Family Systems Theory	19
Parenting Typically-Developing Preschoolers	20
Parents' Self-Reports About ADHD Behaviours	
In Their Child	21

	Family Interactions With Children At-Risk for ADHD	24
	Television Viewing	26
	Content of Children’s Television Programming	29
	Television and Attentional Difficulties	31
	Television and Aggressive Behaviour	33
	Differences Between Canadian and American Families	35
	Purpose of the Proposed Research	36
	Purpose	36
	Research Questions	36
	Hypotheses	37
III.	METHOD	
	Participants	38
	Measures	39
	ADHD Rating Scale-IV	39
	Medical and Developmental History Form	40
	Television Viewing Questionnaire	40
	Procedures	40
IV.	RESULTS	
	Preliminary Analyses	43
	Main Analyses	44
	Hypothesis 1	44
	Hypothesis 2	44

V.	DISCUSSION	
	Review of Primary Research Questions	45
	Review of Findings	46
	Limitations	49
	Clinical Implications	50
	Future Directions	51
	Conclusions	52
	REFERENCES	53
	VITA AUCTORIS	84

LIST OF TABLES

		Page
Table 1	Means and Standard Deviations for Demographics.....	82
Table 2	Means and Standard Deviations for Measures.....	83

Chapter I

INTRODUCTION

Objectives

The present study is focused on the television viewing patterns of Canadian preschoolers presenting with symptoms of Attention Deficit/Hyperactivity Disorder (ADHD). ADHD is one of the most common childhood psychiatric disorders (Lahey et al., 1994). It causes significant impairment (American Psychiatric Association, 2000) and is the primary reason for a large number of referrals for psychological evaluations (Demaray, Schaefer, & Delong, 2003). Consequently, it has a significant impact on society in terms of its stress to families, adverse academic outcomes, and negative effects on self esteem (Barkley, 1998). Although there are a number of studies that suggest a strong genetic component (Bidwell, Willcutt, DeFries, & Pennington, 2007; Faraone et al., 2005; Todd et al., 2005), environmental factors clearly also play a role in the manifestation of this disorder. One such environmental factor that has been receiving an increased amount of attention is early television viewing. As suggested by numerous studies, television plays a significant role in the lives of most of the families (Christakis, Ebel, Rivara, & Zimmerman, 2004; Huston & Wright, 1997; Rideout, Foehr, Roberts, & Brodie, 1999; Wright et al., 2001). Results from several studies suggest that attentional problems may be related to early television viewing (Christakis, Zimmerman, DiGiuseppe, & McCarthy, 2004; Miller et al., 2007; Zimmerman & Christakis, 2007) however, interpretations of the findings vary. As such, it is important to further investigate the association between television viewing in the early years and children's cognitive development. The first goal of the present study is to compare the television viewing patterns of preschoolers presenting with symptoms of ADHD to control children.

Additionally, as the majority of the extant studies have been done in the United States, the secondary goal is to describe a Canadian sample.

It is hoped that data from the present research regarding the association of television viewing and symptoms of ADHD will enhance current understanding of this multifactorial disorder, inform clinical practice, and further educate parents and teachers of preschoolers presenting with symptoms of ADHD.

Chapter II

LITERATURE REVIEW

Organization of Review

This chapter begins by reviewing the importance of examining ADHD symptoms in preschool children and outlines studies that have shown ADHD symptoms in preschool to be predictive of later behavioural problems and ADHD diagnosis. It is followed by the discussion of the etiology of ADHD. A family systems theory framework will be used to address the interaction between parenting practices and preschoolers that present with symptoms of ADHD and their typically developing counterparts. Additionally, television viewing patterns of preschoolers presenting with ADHD symptoms and typically developing peers will be described.

The Nature of ADHD

Attention Deficit/Hyperactivity Disorder (ADHD) is a highly heritable, heterogeneous, and chronic behavioural syndrome which is clinically defined by developmentally-inappropriate problems with distractibility, hyperactivity, and impulsivity (American Psychiatric Association, 1994). Diagnostic criteria require that symptoms must be (i) observed before 7 years of age, (ii) present across multiple contexts, and (iii) persist over at least six months (American Psychiatric Association, 1994). It is recommended that diagnosis be made cautiously in children younger than 4 or 5 years of age as symptoms may vary with individual's developmental level and age (American Psychiatric Association, 2000). Specifically, the highly variable, yet developmentally expected behaviour of many preschoolers frequently resemble symptoms of ADHD (American Psychiatric Association, 2000). Consequently, preschoolers presenting with symptoms of ADHD are often referred to as "at-risk" for

ADHD rather than as having the disorder. This condition of childhood and adolescence is seen in all ethnic groups, social classes, and nationalities (Barkley, 2000). It has been estimated that 3% to 7% of the school age population has ADHD and that it affects boys approximately three times more often than girls (American Psychiatric Association, 2000). While the etiology of ADHD remains unclear, the most current findings implicate genetic factors (Bidwell, Willcutt, DeFries, & Pennington, 2007; Faraone et al., 2005; Todd et al., 2005), and specifically the dysregulation of catecholaminergic systems which are thought to regulate attention (Faraone & Biederman, 1998; Maher, Marazita, Ferrell, & Vanyukov, 2002; Purper-Ouakil et al., 2005).

Over the past 15 years, knowledge about the etiology of ADHD has increased significantly due to numerous familial studies that have reported a strong genetic component ranging from 60% to 90% and non-shared environmental influences ranging between 10% and 40% (Biederman et al., 1992; Cadoret & Stewart, 1991; Silberg et al., 1996; Waldman & Rhee, 2002). Although heritability estimates indicate that most of the variance in the ADHD-phenotype is due to genetic factors, a sizable literature also exists on early environmental characteristics associated with ADHD (Campbell, 1994; Cunningham & Boyle, 2002; Nomura, Rajendran, Brooks-Gunn, & Newcorn, 2008). For instance, recent research suggests that perinatal problems such as low birth weight, small head circumference, and Apgar scores are implicated in expression of early childhood behavioural difficulties (Nomura et al., 2008). Furthermore, babies born to mothers using tobacco and alcohol during pregnancy are more likely to later be diagnosed with ADHD (Kotimaa et al., 2003; Sood et al., 2001; Thapar et al., 2003). Other studies indicate that perinatal factors, including preterm birth and low birth weight, as well as inadequate nutrition contribute to the list of environmental risk factors of ADHD (Lou et al., 2004;

Schnoll, Burshteyn, & Cea-Aravena, 2003). As described above, both genetics and perinatal factors contribute to the etiology of ADHD and should be carefully considered prior to the diagnosis.

The role of early childhood experience, particularly the interplay of parent and child behaviour, influences the expression of both genetic and environmental factors (Shaw et al., 1998) as well as the long term stability of externalizing symptoms (Campbell et al., 1982; 1984; 1990; 1991; 1994). Majority of the studies have reported that parents with ADHD are less able to parent effectively (Chronis-Tuscano et al., 2008; Cunningham & Boyle, 2002; DuPaul, McGoey, Eckert, & VanBrakle, 2001; Marks et al., 2006). In turn, behaviours commonly associated with ADHD in early childhood have been found to often affect parent reports of distress (Cunningham & Boyle, 2002). For example, Cunningham and Boyle (2002) reported that mothers of children at-risk for ADHD also reported higher personal depression scores than those of the non-ADHD subgroup. Cunningham and Boyle (2002) also found that mothers of these “hard-to-manage” preschoolers suggested twice as many controlling/negative management strategies as positive/preventive strategies and would increase the former and decrease the latter in the presence of child’s difficult, temperamental behaviour. These findings support the earlier reports suggesting that the more controlling/negative parenting strategies tend to be elicited by active, inattentive, and poorly regulated behaviour of children with ADHD (Barkley & Cunningham, 1979). Taken together, the evidence suggests that parenting styles and strategies may also influence the expression and impact of ADHD symptoms in children.

Previous research has indicated that preschoolers who display disruptive behaviours at home tend to display difficulties in school and day care settings as well.

Teachers of preschoolers report that children at-risk for ADHD have more socially problematic behaviour, classroom behaviour problems, and internalizing problems relative to other children that are not at-risk for ADHD (Cunningham & Boyle, 2002). For example, preschoolers at-risk for ADHD perform poorly on academic tasks (Lahey et al., 1998) and interact less competently with their peers (DuPaul et al., 2001; Mrug, Hoza, & Gerdes, 2001).

The problems presenting in preschool often persist into adolescence and early adulthood, with approximately 30%-60% of individuals diagnosed with ADHD in youth having symptoms that persist into adulthood (Biederman, 1998; Biederman, Mick, & Faraone, 2000). Specifically, Manuzza and Klein (2000) reported that individuals with ADHD exhibit lower grades, fail more courses, perform worse on standardized tests, have fewer friends, and are rated less adequate in psychosocial functioning. Additionally, individuals with ADHD have been found to report more driving problems such as speeding, vehicular crashes, and license suspensions (Barkley, 2002), and have been found to be at a greater risk for substance abuse (Flory, Milich, Lynam, Leukefeld, & Clayton, 2003) as compared to controls. Taken together, empirical evidence suggests that the effects of childhood ADHD are often present across the lifespan.

Underlying Biology of ADHD

Genetics of ADHD. ADHD is a multimodal psychiatric disorder with genetic and environmental influences (Barkley, 1995; Swanson et al., 2001). Extensive family (Biederman et al., 1992), adoption (Cadoret & Stewart, 1991), and twin (Silberg et al., 1996) studies have shed some light on the etiology of ADHD noting an estimated 60%-90% heritability level (Faraone et al., 2005; Levy, Hay, McStephen, Wood, & Waldman, 1997; Thapar et al., 1999). Furthermore, data from multiple studies describe ADHD as

the most heritable of all psychiatric disorders (Biederman et al., 1992; Cadoret & Stewart, 1991; Silberg et al., 1996; Todd et al., 2005). Additionally, studies have indicated that ADHD is a complex disorder involving multiple genes of moderate (Barr et al., 2001b; Faraone et al., 2005; Manor et al., 2001) or minimal effect (Payton et al., 2001). Overall, compelling evidence exists for four genes in ADHD: the dopamine D4 gene (Comings et al., 1999b; Huang et al., 2002; Qian et al., 2003) and D5 receptors (Kustanovich et al., 2004; Mill et al., 2004; Payton et al., 2001), and the dopamine (Hawi et al., 2003) and serotonin (Beitchman et al., 2003) transporters. Studies have implicated other genes in ADHD (Eisenberg et al., 1999), but results have been less clear (Hawi, Millar, Daly, Fitzgerald, & Gill, 2000; Qian et al., 2003).

Although both the serotonergic and noradrenergic systems have also been implicated in ADHD, the dopaminergic system is by far the most extensively explored to date. Hawi and colleagues, (2003) reported that the most extensively studied genes of the dopaminergic system are DRD4 and DAT1. Following LaHoste and colleagues' (1996) finding that patients with ADHD were more likely to carry the DRD4 7-repeat allele than control subjects, several attempts to replicate these findings have been noted and have provided variable results. In general, numerous studies have reported that despite the marked variability across studies there is an overall support for the association of dopamine system genes and ADHD (Faraone, Doyle, Mick, & Biederman, 2001; Maher, Marazita, Ferrell, & Vanyukov, 2002; Purper-Ouakil et al., 2005). Furthermore, research has demonstrated that approximately 70% of patients with ADHD (Spencer et al., 1996) respond positively to stimulant medications (methylphenidate and dexamphetamine) that block the reuptake of dopamine by the dopamine transporter (Amara & Kuhar, 1993; Krause, Dresel, Krause, Kung, & Tatsch, 2000). Taken together, while multiple studies

provide evidence to suggest that the dopaminergic system is implicated in the presence of ADHD symptoms, the specific mechanisms of effect remain to be seen.

As previously noted, other neurotransmitters have been found to play a role in the manifestation of ADHD symptoms. More specifically, Arnsten, Steere, and Hunet (1996) hypothesized that the noradrenergic and adrenergic neurotransmitters influence certain aspects of executive control and attentional processing. Consequently, much research has been conducted on the association of abnormalities in the noradrenergic neurons and ADHD (Barr et al., 2000a; Barr et al., 2000b; Barr et al., 2001b; Comings et al., 1999a; Xu et al., 2001). The results from these studies are far from unequivocal, with some studies supporting a relationship between noradrenergic systems and ADHD (Barr, et al., 2000a; Barr, et al., 2000b; Comings et al., 1999a), while others have not found such an association (Barr, et al., 2001a; Xu et al., 2001). Further variability has been found with respect to the involvement of serotonin dysregulation in ADHD that has been hypothesized to be related to impulsive and aggressive behaviour in children (Halperin et al., 1997; Kent et al., 2002; Spivak et al., 1999). Neuropharmacological studies have demonstrated reduction in ADHD symptoms after administration of selective serotonin reuptake inhibitors (SSRIs; Gainetdinov, Wetsel, Jones, Levin, & Jaber, 1999; Solanto, 1998) and research from Manor and colleagues (2001) reported a significant association between these serotonin-related genes and ADHD.

Although the studies described above demonstrate variability with respect to the involvement of specific genes in ADHD, there is an overarching theme that suggests an innate neurochemical imbalance present in children with ADHD as compared to children without ADHD. Specifically, the research has focused on the abnormalities in the

dopaminergic system of the frontal lobes and has demonstrated the importance of genetic influence in the development of this disorder.

Neuroanatomical structure and function of ADHD. In addition to previously mentioned functional characteristics of ADHD, current meta-analyses have demonstrated some variable findings with respect to the neuroanatomy of ADHD (Faraone et al., 2001; Lowe et al., 2004; Todd, et al., 2005) and its highly heritable biology. In their imaging study, Durston and colleagues (2004) found volumetric differences amongst children with ADHD and their unaffected siblings that were not present amongst the matched controls. Specifically, they reported a 9.1% reduction in the right prefrontal gray matter and left occipital gray and white matter in boys with ADHD and their unaffected siblings. Additionally, these authors reported 4.0% reduction in intracranial volume in subjects with ADHD and a similar trend amongst their unaffected siblings (Durston et al., 2004). Such findings suggest presence of structural brain differences between children with ADHD and their typically developing counterparts which are likely influenced by genetic factors. Research thus far has shown reduction in total brain volume (Casteallanos et al., 2002; Filipek et al., 1997), the cerebellum (Bussing, Grudnik, Mason, Wasiak, & Leonard, 2002; Castellanos et al., 2001; Durston et al., 2004; Hill et al., 2003), caudate (Castellanos et al., 2003), pallidum (Hill et al., 2003), corpus callosum (specifically the posterior regions; Hill et al., 2003; Semrud-Clikeman et al., 1994), and other cortical regions (Durston et al., 2004; Hill et al., 2003). Specifically, the brain size of individuals with ADHD was bilaterally reduced in the inferior portions of their dorsal prefrontal cortices and anterior temporal cortices. Furthermore, significant bilateral increases in grey matter were recorded in the large portions of the posterior temporal and inferior parietal cortices (Sowell et al., 2003). In addition to these structural differences, Schulz and

colleagues (2005) have found significant functional differences of diverse brain areas during the interference control and response competition tasks. Specifically, there was a significantly greater activation of the left and right ventrolateral prefrontal cortices, left anterior cingulate cortex, and left basal ganglia in the ADHD group when compared to the non-ADHD group. They found a direct relationship such that as the severity of ADHD increased, so did the magnitude of activation in these areas (Schulz et al., 2005). Such studies demonstrate the involvement of the disturbances in the frontostriatal circuits of the brain in children with ADHD.

Related to the previously described findings, neuroimaging studies propose abnormalities in the frontal lobe and associated subcortical structures, regions that are known to be rich in dopaminergic neurotransmission and important in the control of attention and response to organization (Hynd, Semrud-Clikeman, Lorys, Novey, & Eliopoulos, 1990; Peterson et al., 2000; Semrud-Clikeman et al., 2000). In support of these findings, there is also data to suggest that children with ADHD perform poorly on tasks that assess performance in the area of executive functioning, which has been linked to the prefrontal cortex (Carte, Nigg, & Hinshaw, 1996; Houghton et al., 1999). Furthermore, Schulz and colleagues (2005) demonstrated a positive relationship between the severity of ADHD and the magnitude of the prefrontal and basal ganglia activation during interference control and response competition tasks.

In summary, ADHD is a heterogeneous biological disorder with significant genetic risk factors with multiple biological markers. Children with this developmental disorder present with considerable behavioural difficulties that may continue into adulthood. A number of studies have implicated neuroanatomical structural and functional differences in children with ADHD. What is not clear at this time is how these

biological differences may interact with and be potentiated by environmental risk and resiliency factors during the preschool period.

ADHD during the Preschool Years

As mentioned earlier, behaviours characteristic of ADHD (inattention, impulsivity, and hyperactivity) are commonly seen in typically-developing preschoolers (Campbell, 2002; McCellan & Speltz, 2003; Sonuga-Barke, Auerbach, Campbell, Daley, & Thompson, 2005) and these symptoms can easily meet the diagnostic threshold for a diagnosis of ADHD (Healey, Miller, Castelli, Marks, & Halperin, 2008). Furthermore, despite a noticeable increase in the number of children below the age of 5 years receiving the diagnosis (Zito et al., 2000), only 33% of children and adolescents (4 to 18 years of age) with symptoms of ADHD actually meet the full diagnostic criteria for ADHD (Gordon et al., 2006). Consequently, it is not clear that all children who meet diagnostic criteria for ADHD in early childhood will continue to do so into the school-age years (Gittelman, Manuzza, Shenker, & Bonagura, 1985; Gordon et al., 2006).

Typical preschool behaviour. Preschool years are characterized by rapid cognitive development, specifically the emergence of abstraction abilities and cognitive flexibility (Jacques & Zelazo, 2001), basic set-switching, response inhibition (Espy, 1997), working memory, understanding of rules (Espy, Kaufmann, McDiarmid, & Glisky, 1999), visual search (Welsch, Pennington, & Grossier, 1991), attention regulation, impulse control, planning, and motor inhibition (Klenberg, Korkman, & Lahti-Nuutila, 2001).

Anecdotally, parents and teachers usually describe preschoolers as curious and exploratory. Their behaviour is often attention-seeking, without a sense of danger and often challenging for those who need to supervise them, as they nearly always present with a high level of activity. Furthermore, they sometimes appear to be “into everything”

and often misunderstand the correct context due to their still limited knowledge base (Flavell, 1999). Therefore, they may often seem impulsive, inattentive, and/or “difficult-to-manage” in many situations (Flavell, 1999; Campbell, 2002; McClellan & Speltz, 2003; Sonuga-Barke et al. 2005), especially when parents have limited resources and/or multiple demands on their time.

Research suggests that parent and teacher anecdotal reports are generally valid. Preschoolers tend to persist in their actions even after the reward has been removed, fail to respond to feedback, and impulsively perform forbidden acts such as touching items despite specific prohibition (Kirkham, Cruess, & Diamond, 2003). Some have argued that “attentional inertia” may underlie these behaviours in preschoolers (Diamond & Kirkham, 2005). Specifically, perhaps due to their curious nature, preschoolers pay limited attention to the knowledge they gain at one point and tend to focus on the conflicting stimulus properties that are newly engaging and interesting to discover (Diamond & Kirkham, 2005). Furthermore, preschoolers have been found to exhibit developmentally-expected difficulties with higher order control of cognitive processes at hand, lack inhibitory control, and display consequential impulsive behaviour as well as emotional dysregulation (Espy, Senn, & Kaufmann, 2001). Additionally, they tend to be distractible, inflexible, and disorganized (Espy, Senn, & Kaufmann, 2001). This overall lack in executive capacity of preschoolers has been demonstrated across many studies (Bull, Espy, & Wiebe, 2008; Espy & Bull, 2005; Senn, Espy, & Kaufmann, 2004) and has made it difficult to differentiate clinically significant executive dysfunction postulated to be present in preschoolers at-risk for ADHD from their typically developing counterparts.

Preschoolers at-risk for ADHD. Numerous studies have been conducted in order to compare typically developing preschoolers with those at-risk of ADHD. Findings thus

far have been far from clear (Marks et al., 2005), but in general researchers have suggested significant differences in executive functioning (Campbell, 1994; Hughes, Dunn, & White, 1998; Mariani & Barkley, 1997), attentional control (Campbell, 1994; Cunningham & Boyle, 2002), and social behaviour (Henricsson & Rydell, 2006) amongst these two groups. A few recent studies have demonstrated that despite the omnipresent parental reports of increased activity among their preschoolers at risk of ADHD, these children did not significantly differ from their age-matched controls during the unrestricted play with selection of toys and without an adult within direct view (Byrne, DeWolfe, & Bawden, 1998; DeWolfe, Byrne, & Bawden, 2000). Specifically, researchers have found similar levels of out-of-seat behaviour (Byrne, DeWolfe, & Bawden, 1998), degree of mobility (Byrne, DeWolfe, & Bawden, 1998), and objectively defined levels of impulsivity (DeWolfe, Byrne, & Bawden, 2000) during testing in both groups. Also, once the authors accounted for nonexecutive abilities there was no significant relationship between deficits of preschoolers at-risk for ADHD and executive functioning (Marks et al., 2005). However, researchers have suggested that the noted discrepancies in the findings may be due to methodological limitations of the current research (e.g. variability in selection and diagnostic criteria, small sample sizes), small effect sizes (Pennington & Ozonoff, 1996), and frequent disregard for psychiatric comorbidity (Sergeant, Geurts, & Oosterlaan, 2002). With this in mind, it is important to note that in addition to parental reports of increased aggression and hyperactivity amongst their preschoolers at-risk of ADHD (Marks et al., 2005), the majority of research continues to demonstrate significant differences between those at-risk of ADHD and those with low risk in the areas of motor control and working memory (Mariani & Barkley, 1997). Furthermore, these “hard-to-

manage” preschoolers also tend to exhibit significantly more deficits with respect to inhibition and cognitive flexibility (Hughes, Dunn, & White, 1998).

Taken together, findings thus far have demonstrated that many preschoolers exhibit poor attentional control, hyperactivity, and impulsivity, all characteristics of individuals at-risk for ADHD. Therefore, those with and without ADHD in the preschool period may not significantly differ with respect to their behaviour and skills. Thus, it may be difficult to differentiate between normal and disordered developmental pathways.

Parent and teacher reports about preschoolers at-risk of ADHD. Despite proposed similarities between preschoolers at-risk for ADHD and their age-matched peers, parent and teacher reports tend to differ between these two groups. According to behaviour ratings, preschoolers exhibiting symptoms of ADHD present with more problem behaviour in various settings and tend to have more social difficulties than their typically-developing counterparts (DuPaul et al., 2001). Early studies have found that parents and teachers complain about the externalizing behaviours of preschoolers at-risk for ADHD such as overactivity, inattention, aggression toward peers and management problems (Richman, Stevenson, & Graham, 1982). More recent research continues to further explore parent and teacher reports regarding the dysfunctional behaviour of preschoolers at-risk of ADHD at home and school as well as their social issues and peer problems (Campbell, 1994; DuPaul et al., 2001; Cunningham & Boyle, 2002; Henricsson & Rydell, 2006; Marks et al., 2006; Murray et al., 2007).

Specifically, studies suggest that parents of preschoolers at-risk of ADHD perceive them as more demanding, less socially skilled, and more stressful to rear (Pelham & Lang, 1999). Additionally, they are rated by their parents as having more impulse control difficulties (Campbell, 1994) and attentional problems (Campbell, 1994;

Cunningham & Boyle, 2002), being less compliant to their parents' instructions and sustaining their compliance for shorter periods of time (Byrne, DeWolfe, & Bawden, 1998; Johnston, 1996). With respect to parenting, they were rated as more stressful to manage, less reinforcing, more demanding, less adaptable to change, and less compatible with the parent (Byrne et., 1998; DeWolfe, Byrne, & Bawden, 2000). Preschoolers at-risk of ADHD are found less likely to remain on-task and tend to display more dysfunctional behaviour than their peers (Campbell, 1994; Johnston, 1996). Taken together, these findings suggest that preschoolers at-risk for ADHD are often perceived by their parents as hard-to-manage, difficult to adapt to social requirements, and less reinforcing.

The problematic behaviours reported by parents are not confined to the home environment. According to teacher reports, preschoolers at-risk for ADHD tend to exhibit more attentional problems (Campbell, 1994; Cunningham & Boyle, 2002), impulse control problems (Campbell, 1994), negative social behaviour such as aggression (Cunningham & Boyle, 2002), and score significantly lower on tests of preacademic skills (Alessandri, 1992; DuPaul et al., 2001). Upon school entry, preschoolers at-risk for ADHD, who were also identified as having more internalizing symptoms (Cunningham & Boyle, 2002), tend to be behind their age-matched peers in basic math concepts, prereading skills, and fine motor abilities (Lahey et al., 1998; Mariani & Barkley, 1997). These difficulties are likely to persist and become notable academic problems (Kuhne, Schachar, & Tannock, 1997). Teachers also reported that children at-risk for ADHD tend to work less, behave more poorly, present problems in more situations, and have more social difficulties than their typically developing peers (Cunningham & Boyle, 2002; Kuhne et al., 1997). Taken together, these studies indicate that children at-risk of ADHD

tend to experience difficulties academically as well as struggle socially in the school setting.

The difficulties preschoolers at-risk for ADHD experience at home and school tend to generalize to their everyday social interactions. One such difficulty is social competence characterized by willingness to help, share and cooperate, and by the ability to respond to other's social suggestions and to take initiatives (Rydell, Hagekull, & Bohlin, 1997). Since there is substantial evidence connecting externalizing behaviour problems such as aggression and disruptive behaviour to peer rejection difficulties (Newcomb, Bukowski, & Patte, 1993) it is not surprising that preschoolers at-risk for ADHD have been found to interact less competently with peers (Alessandri, 1992; DuPaul et al., 2001) and to be inclined to have difficulties with social competence and peer acceptance at school, home, and other social settings (Campbell, 1994; Cunningham & Boyle, 2002; Henricsson & Rydell, 2006). Additionally, due to their impulsive and overactive nature, young children at risk of ADHD appear to be at greater than average risk for physical injuries and accidental poisonings (Lahey et al., 1998).

Overall, current research has indicated that in multiple domains, including home, school, and other social settings, preschoolers at-risk of developing ADHD have been rated by their parents and teachers as more likely to have persistent behavioural, academic, and social difficulties relative to their peers without ADHD (DuPaul et al., 2001; Lahey et al., 2004). Furthermore, preschoolers with moderate to severe symptoms of ADHD experience increased risk of physical injury and impairment.

Persistence of ADHD symptoms. In order to improve the understanding of the severity of the difficulties preschoolers at-risk for ADHD are faced with, multiple studies have been conducted over the last two decades to assess the persistence of ADHD

symptoms. In general, evidence suggests that there is a moderate correlation between ADHD symptoms during preschool for these “hard-to-manage” children and their symptoms during elementary school (Campbell, Ewing, Breaux, & Szumowski, 1986; Campbell, Szumowski, Ewing, Gluck, & Breaux, 1982; Ewing, & Campbell, 1999; Richman et al., 1982; von Stauffenberg & Campbell, 2007). Therefore, symptoms remain somewhat stable from preschool into elementary school. One of the first major studies was conducted by Richman and colleagues (1982) who assessed three year-old children and followed their development up to the age of eight years. They found that mothers and teachers reported that children with difficulties such as inattention, hyperactivity, poor sibling relations, and behavioural problems such as tantrums and attention-seeking behaviour during preschool continued to exhibit these problems through to the age of eight years. Campbell and colleagues (1982) also followed preschoolers at-risk of ADHD, identified as such by teacher and parent reports. Children identified as “hard-to-manage” at three years of age were found to continue to exhibit these difficulties at home and at school at age four (Campbell, Breaux, Ewing, & Szumowski, 1984). When followed up at the age of six years, 50% of participants continued to be identified as having significant problems according to their parents’ report on the Child Behaviour Checklist (CBCL) as well as during the interview (Campbell et al., 1982).

In the more recent, longitudinal studies, Campbell and colleagues (Campbell, 1994; Campbell, March, Pierce, Ewing, & Szumowski, 1991; Pierce, Ewing, & Campbell, 1999; von Stauffenberg & Campbell, 2007) studied a much larger group of four year old boys identified by parents and teachers as “hard-to-manage” in order to further examine the persistence of ADHD symptoms at age six. At the initial assessment, they were found to be more inattentive, overactive, impulsive, and noncompliant at home,

in the laboratory playroom, and in the classroom as compared to their age matched controls. At age six, these boys were found to continue to express higher levels of impulsivity and hyperactivity and perform more poorly on laboratory tests of social interaction (Campbell et al., 1994). Further studies reported a similar longitudinal relationship between preschool difficulties and behaviour at six years of age (Campbell, 1994; Campbell et al., 1991; Pierce, Ewing, & Campbell, 1999). In particular, the boys who initially met diagnostic criteria for ADHD were rated as more aggressive, delinquent, and oppositional compared to comparison peers and continued to express these behaviours at age six years (Pierce, Ewing, & Campbell, 1999). Additional follow-up studies suggested that preschoolers whose problems persisted were more likely to meet the criteria for ADHD diagnosis at 9 and 13 years of age than the children whose early problems were less stable (Pierce, Ewing, & Campbell, 1999; von Stauffenberg & Campbell, 2007). In combination, these findings provide additional, objective evidence that suggests that preschoolers may be more likely to continue to express “hard-to-manage” behaviour and difficulties when found at-risk of developing ADHD during preschool.

Taken together, high rates of persistent hard-to-manage behaviour have been proposed by follow-up studies of preschoolers identified as at-risk of developing ADHD. However, these studies also indicate that not all children originally identified at-risk of developing ADHD remain highly symptomatic at a later age. Only approximately 50% of the preschoolers who presented with significant symptoms of ADHD early on continued to meet diagnostic criteria for the disorder later in childhood or early adolescence (Barkley, 1998; Greenhill, Posner, Vaughan, & Kratochvil, 2008). Consequently, it is safe to conclude that “hard-to-manage” behaviour during preschool does not perfectly predict

ADHD diagnosis in later childhood and adolescence and that future research must also consider the role of other factors.

In summary, preschoolers in general tend to exhibit behaviours such as inattention, impulsivity, and hyperactivity that are characteristic of ADHD. Consequently, preschoolers at risk of ADHD are very similar to their typically developing peers, making accurate diagnosis difficult during the preschool years when there is a high degree of overlap in what is deemed ‘normal’ preschool behaviour and symptoms of ADHD. Therefore, it is important to understand developmentally-typical preschool behaviour in order to reduce a chance of over-diagnosing ADHD.

Parenting Practices and Family Systems Theory

As described above, childhood hyperactivity is believed to arise due to an intricate interplay of biological and environmental factors (Biederman et al., 1992; Cadoret & Stewart, 1991; Silberg, et al., 1996; Waldman & Rhee, 2002). With regards to the latter, particular parenting and family factors have been proposed as predictors of the emergence (Shaw et al., 1998; Shaw, Vondra, Hommerding, Keenan, & Dunn, 1994) and stability across time (Campbell, 1994; Deater-Deckard, Dodge, Bates, & Pettit, 1998; Lengua, 2006) of externalizing symptoms such as hyperactivity (August, Braswell, & Thuras, 1998). These findings are not surprising when viewed within the framework of family systems theory (Cox & Paley, 1997; Minuchin, 1985) which views the family as an organized whole with many interacting and consequently interdependent components. Viewing the family as a dynamic social system allows for the consideration of multiple influences, such as parenting and child’s “hard-to-manage” behaviour, on the development and adaptation of the child (Cox & Paley, 1997). As a result of these influential factors, patterns, such as parental strategies and child’s expectations, are

developed and maintained in the family through time, which in turn regulate the behaviour of system members, specifically parents and the child (Minuchin, 1985). In attempting to explain differences in terms of typical and atypical development of preschoolers, family systems theory takes into account environmental factors such as parenting which are thought to interact with children's characteristics in order to create a dynamic system that guides a child's development. The following section will address the contribution of the environment (more specifically parenting) to the development of ADHD by focusing on the parent-child relationship and its reported involvement in children's typical and atypical emotional, behavioural, and social development (Cox & Paley, 1997; Paley, Conger, & Harold, 2000).

Parenting typically-developing preschoolers. Early theories of attachment (Bowlby, 1969) and parenting style (Baumrind, 1966) have proposed that children's long-term mental development and well-being are positively influenced by the affective quality of the parent-child relationship (Colman, Hardy, Albert, Raffaelli, & Crockett, 2006). Moreover, children are theorized to be active participants in family relationships rather than passive recipients of parenting (Maccoby, Snow, & Jacklin, 1984). Consequently, it is not surprising that parent-child interaction and parenting stress have been found to play a significant role in child development (Barkley, Anastopoulos, Guevremont, & Fletcher, 1992; Schermerhorn, Cummings, DeCarlo, & Davies, 2007), particularly in the preschool years relative to later childhood and adolescence, when the influence of peers becomes increasingly important.

Although parenting is rewarding for most parents (Rogers & White, 1998), parenting a child provides ever-changing challenges as the child grows and develops. It is apparent that preschoolers in general have difficulty sitting down, playing quietly, or

awaiting their turn. Moreover, during the preschool years children are found to show significant changes in their ability to control their negative emotions and regulate activity, attention, and impulses (Campbell, 2002; Losoya, Eisenberg, & Fabes, 1998). Consequently, it is important to take into account that “hard-to-manage” behaviour amongst the typically developing preschoolers may be an age-related and temporary manifestation of difficulties that will be outgrown (Campbell, 2002). These findings illustrate that typical preschoolers may share many of the characteristics of those identified as being hyperactive. As such, there may be tense interactions between the parent and child which may contribute to parenting stress (Crnic, Gaze, & Hoffman, 2005). It is not surprising then that often challenging behaviour exhibited by typically developing preschoolers, coupled with isolated events such as parenting daily hassles, and numerous responsibilities that accompany child rearing, often accumulate into a major cause of parental stress (Creasey & Reese, 1996; Crnic & Greenberg, 1990). As a result, parents often report that their preschoolers are challenging to parent, regardless of any diagnoses of ADHD that may or may not be present.

Parents’ self-reports about ADHD behaviours in their child. Typical parenting strategies are often less effective when a child has ADHD. Anecdotally, parents of children with ADHD often report that they feel inadequate in their role as parents, or may begin to think that their child is defective in some way compared to siblings (Lerner, Lowenthal, & Lerner, 1995). As previously described, hyperactive preschoolers have been found to be more non-compliant (DuPaul et al., 2001; Marks et al., 2006) and have been rated by their parents as less socially skilled, more demanding, and more stressful to rear (Pelham & Lang, 1999). Given the stressful nature of parenting children with ADHD (Johnston & Mash, 2001) and the fact that preschool is the time when expectations

regarding both compliance and independence may pose further challenges to parent and child, it is not surprising that the parents of preschoolers at-risk of ADHD have been found to report more family dysfunction (DuPaul et al., 2001), environmental adversity (Counts, Nigg, Stawicki, Rappley, & Von Eye, 2005; McGee, Partridge, Williams, & Silva, 1991), drinking problems (Chronis-Tuscano et al., 2003), and higher rates of divorce (Wymbs et al., 2008) than controls.

With respect to family dysfunction and environmental adversity, numerous studies have found that parents of hyperactive children report greater levels of distress, anger, and child rearing difficulty (Fischer, 1990; Cunningham & Boyle, 2002; Marks et al., 2006). Specifically, mothers of children at-risk for ADHD report lower self-esteem (Hoza et al., 2000) as well as higher personal depression scores (Mash & Johnston, 1990; Cunningham & Boyle, 2002), self-blame (Mash & Johnston, 1990), and social isolation (Mash & Johnston, 1990) than mothers without children at-risk of ADHD. For example, approximately 40% of mothers with children with ADHD have been found to have a history of major depressive disorder (Chronis-Tuscano et al., 2003). Furthermore, DuPaul and colleagues (2001) have indicated that parents of preschoolers at-risk for ADHD report lack of social support (DuPaul et al., 2001) and tend to also report higher parenting stress (Ostberg & Hagekull, 2000). Although parents of children with ADHD do not abuse alcohol more frequently than other parents, they have been found to drink more than parents of non-problem children (Molina, Pelham, & Lang, 1997; Chronis-Tuscano et al., 2003). Increased number of residential moves was also noted amongst families of children with ADHD (Barkley, Fischer, Edelbrock, & Smallish, 1990) and researchers state that this tends to disrupt both child and family networks, reduce supportive contacts, and exacerbate behaviour problems (Wood, Halfon, Scarlata, Nesacheck, & Nessim,

1993). Parents of children with ADHD often report feeling inadequate in the role as parents and consequently feel added pressure, stress, have a higher chance of becoming depressed, and may engage in inappropriate alcohol use. All these disruptions have been proposed to negatively influence their developing children.

Although research has not consistently supported proposed differences in the prevalence of divorce between families of children with ADHD and those without diagnosed children (Barkley, Fischer, Edelbrock, & Smallish, 1991; Minde, Tidmarsh, & Hughes, 2001; Schachar & Wachsmuth, 1991), numerous studies have revealed that in general, divorce appears to be more common among families of children with ADHD (Barkley et al., 1990; Faraone, Biederman, Keenan, & Tsuang, 1991; Wymbs et al., 2008). Moreover, these parents report less marital satisfaction (Johnston & Behrenz, 1993; Lindahl, 1998) as compared to controls. Specifically, parents of children with ADHD are approximately three times more likely to divorce (Wymbs et al., 2008) than parents of typically developing children. Furthermore, they also tend to dissolve marriages more quickly (Wymbs et al., 2008), thus exposing a child to a greater risk for poor developmental outcomes (Amato, 2000). These findings are not surprising given that dysregulated child behaviour, as related to internalizing and externalizing problems (Schermerhorn, Cummings, DeCarlo, & Davies, 2007), has been linked to increases in interparental discord (Johnston & Mash, 2001; Schermerhorn et al., 2007).

Taken together, these findings suggest that parents of preschoolers at-risk of ADHD often feel inadequate in their role as parents. Consequently, they report greater levels of distress, anger, child rearing difficulty, and high percentage of mothers have reported having a history of major depressive disorder. Finally, higher levels of family

dysfunction and subsequent divorce as compared to the families with typically developing children have been reported.

Family interactions with children at-risk of ADHD. One study suggested that parent-child similarity in ADHD symptoms improves the relationship quality between the parent and child, such that children with high ADHD symptoms received more positive and affectionate responses from mothers who also score high on ADHD symptoms scales (Psychogiou, Daley, Thompson, & Sonuga-Barke, 2008). However, this stands in contrast to the majority of studies that have reported that parents with ADHD are less able to parent effectively (Chronis-Tuscano et al., 2008; Cunningham & Boyle, 2002; DuPaul, McGoey, Eckert, & VanBrakle, 2001; Marks et al., 2006).

Various studies have found that families of children at-risk of ADHD function more poorly than families where ADHD is not present (Barkley et al., 1991; Cunningham & Boyle, 2002; Wymbs et al., 2008). More specifically, preschoolers at-risk of ADHD have been described as less compliant, less likely to remain on-task, and tend to display more negative behaviours than their typically developing counterparts. Given these differences, children at-risk of developing ADHD may pose greater challenges for their parents. As a result, their mothers and fathers tend to display more directive and commanding behaviours, show more disapproval, give fewer rewards that are contingent on the child's prosocial and compliant behaviours, and tend to display more overall negative behaviour in interactions with their child (Barkley, Karlsson, Pollard, & Murphy, 1985). Johnston (1996) has termed these types of interactions "negative" response patterns. This notion has been further supported in more recent studies that show elevated levels of negative interactions, angry conflicts, and less positive and facilitative behaviour between parents and children with ADHD (Barkley, 1998; Barkley

et al., & Fletcher, 1992; Chronis-Tuscano et al., 2008; Johnston, 1996; Marks et al., 2006). Taken together, the research suggests that parents of children with ADHD engage in more negative interactions than parents of non-problem children.

Observations of mother-child playroom interactions indicate that mothers of hyperactive children are less responsive to appropriate child behaviour, are more controlling, intrusive, and/or punitive (Barkley, 1998; Cunningham & Barkley, 1979; Cunningham & Boyle, 2002; Marks et al., 2006). Furthermore, they provide controlling/negative management strategies two times more often than positive/preventive strategies (DuPaul et al., 2001; Cunningham & Boyle, 2002) and overall provide less encouragement to their children (Cunningham & Barkley, 1979; Marks et al., 2006). Parents of preschoolers at-risk of ADHD are less likely to seek support from relatives and neighbours, and are less capable of managing stressful situations relative to parents of typically developing preschoolers (DuPaul et al., 2001). In general, they make more specific demands and issue more instructions while being overall more critical of their child's performance relative to the parents of children without behavioural issues (Roberts, 2001). Finally, given that the heritability of ADHD is 80% (Faraone et al., 2000) and that the disorder persists into adulthood in some individuals (Barkley, Fischer, Smallish, & Fletcher, 2002), it is not surprising that the parents of preschoolers at-risk of ADHD are at increased risk for an ADHD diagnosis themselves. In general, maternal ADHD symptoms have been found to be negatively associated with positive parenting (Chronis-Tuscano et al., 2008). Specifically, mothers with higher levels of ADHD symptoms reported higher levels of inconsistency in their disciplinary strategies as well as the use of repeated commands before allowing the child the time to comply, and lower levels of involvement and positive parenting (Chronis-Tuscano et al., 2008).

In summary, preschoolers may be challenging to rear and parents of preschoolers often report high levels of stress. However, parenting preschoolers at-risk of ADHD poses further challenges to the child-rearing skills of their parents. They require far more frequent and closer monitoring of their ongoing conduct than do typically-developing preschoolers, and are likely to prove the most distressing to their parents. Furthermore, parents have been found to employ more negative management techniques and provide less encouragement for the appropriate behaviour. As a result, research suggests that parents of preschoolers at-risk of ADHD report higher levels of stress, environmental adversity, and divorce relative to parents of typically developing children.

Television Viewing

As previously mentioned, family systems theory views the family as a dynamic social system with numerous interacting and consequently interdependent components (Minuchin, 1985). Therefore, other factors in addition to parenting skills, stress levels, and child's hard-to-manage behaviour, should also be addressed as important environmental influences in child development. One such factor is television, a near-constant in the lives of young children (Cox & Paley, 1997; Paley et al., 2000) that takes up a significant amount of their time daily (Huston & Wright, 1997). As a result, the relationship between child development and television viewing specifically has received significant attention in the literature (Huston & Wright, 1997; Rideout, Foehr, Roberts, & Brodie, 1999; Rideout, Vandewater, & Wartella, 2003). Additionally, it has been reported that 95% of children tend to watch programs with elements of violence (Comstock & Paik, 1991). Consequently, several studies have been conducted and have reported an association between television viewing patterns among preschoolers and inattention, aggressive behaviour as well as ADHD diagnosis (Christakis, Zimmerman, DiGiuseppe,

& McCarthy, 2004; Christakis & Zimmerman, 2007; Miller et al., 2007; Zimmerman & Christakis, 2007; Zimmerman, Glew, Christakis, & Katon, 2005).

As the 21st century begins, there has been an exponential increase in the availability and variety of television programming (Bushman & Anderson, 2001). For instance, research suggests that families have access to about 50 to 100 different television channels at home (Rideout et al., 1999). As such, television viewing is becoming a frequent activity of many children that consumes an average of approximately three hours a day (Huston & Wright, 1997; Rideout et al., 1999), more than any other activity except sleep (Certain & Kahn, 2002). Therefore, understanding its role in children's lives and how age, gender, and social status can affect television viewing patterns is crucial. Accordingly, Wright and colleagues (2001) conducted a study using a nationally representative sample of 2,902 American children (ages 0 to 12) and their parents in the United States. Participants were asked to report the titles of television programs and videos that the children watched in two 24 hour time-use diaries, one from a weekend day and one from a weekday. Wright and colleagues (2001) examined differences in total time and in time spent with specific television genres amongst boys and girls of different ages. Their findings support previous research that older children (9 to 12 years of age) and preschoolers (three to five years of age) engage in television watching more than older and younger children (Comstock, 1991; Huston, Wright, Marquis, & Green, 1999; Wright et al., 2001). The authors proposed that different contextual demands between home and school could account for the observed pattern as well as the increased amount of television viewing children engage in on the weekend as compared to the weekday (Wright et al., 2001). Furthermore, two- to three-year-olds have been found to spend a significant amount of time in "secondary" viewing (watching

television in the company of an adult who is viewing), which typically declines with age (Wright et al., 2001). This pattern was steadier for girls with a slight dip in the six-to-eight-year-old group, while boys displayed an inverted “U”-shaped pattern of secondary viewing with a peak among the preschool group of boys (Wright et al., 2001). Although television viewing preferences change with age amongst boys and girls (Huston, Wright, Rice, Kerkman, & Peters, 1990), research has found additional small, but fairly consistent, gender differences in total television viewing time (Wright et al., 2001). Specifically, boys watch more television than girls in general (McKenzie, Sallis, Nader, & Broyles, 1992). Overall, research findings propose that young children engage in many hours of television watching daily, and boys watch significantly more television than girls.

Furthermore, preferred genres of television programs viewed also change with age and show small gender differences (Funk, Germann, & Buchman, 1997; Wright et al., 2001). More specifically, educational program viewing has been found to peak around age four (Funk et al., 1997) with preschoolers mostly watching educational programs and non-educational cartoons (Wright et al., 2001). Comstock (1991) reported that social status predicts differences in television watching: poor and minority children, especially boys, watch less educational and informative programming and more violent and other commercial entertainment television than do children of majority and middle-class groups.

Taken together, these findings suggest that preschoolers are engaged in watching television for a significant portion of their day with boys watching more television than girls in general. Furthermore, very young children tend to engage in high levels of secondary viewing and consequently watch whatever their adult caregiver is watching.

Although it appears that preschoolers' television viewing is focused on educational programs and noneducational cartoons, educational television viewing declines rapidly with age. It also appears that children considered most at-risk for many negative outcomes, namely children living in poverty and children of minority status, are more likely to experience high levels of non-educational television viewing.

Content of children's television programming. A few generations of children have grown up watching educational programs such as *Sesame Street* and there is abundant evidence that preschoolers can learn numerous skills from these programs such as new vocabulary and number recognition (Rice, Huston, Truglio, & Wright, 1990). However, recent studies indicate that preschoolers are also exposed to high levels of non-educational television programming (Christakis & Zimmerman, 2007) and have demonstrated different effects of educational and noneducational television programming on children's cognition (Geist & Gibson, 2000), learning (Hooper & Chang, 1998), language, and behaviour (Zimmerman & Christakis, 2007). Educational programs such as *Sesame Street* target preschoolers between three and five years of age and are often designed to prepare children for school. Specifically, educational programs aim to teach letter recognition, numbers, and simple matching and reading skills (Ball & Bogatz, 1970). Additionally, they use child-directed speech that facilitates learning new words (Ball & Bogatz, 1970). This type of speech is adjusted to the child's growing ability level and stimulates development of neurological processes necessary for language development (Kuhl, Tsao, & Liu, 2003; Snow, 1994). In contrast, non-educational programs have been found to offer too much stimulation to be comprehensible by young children and cannot attune and adjust to the specific verbal needs of a child (Krcmar, Grela, & Lin, 2007). As such, these programs may not be ideal as language teachers.

With respect to attention and behaviour of the child, early findings by Friedrich and Stein (1973) suggest that preschoolers had greater tolerance for delay after watching an educational show or playing with toys, as compared to the children who watched noneducational shows like *Batman* (Friedrich & Stein, 1973). More recent findings show that children have shorter attention spans immediately after watching *Power Rangers* than those who had played or watched an educational show (Geist & Gibson, 2000). It has been hypothesized that educational shows do not create such risks since they have slower paced scenes and animations that allow the child to receive positive feedback for self-guided attention (Hooper & Chang, 1998). Additional studies suggest that numerous television programs contain fast-paced scenes that affect children's learning habits and expectations and cater to the length of their short-term attention spans (Geist & Gibson, 2000; Zuckerman, Singer, & Singer, 1980). Consequently, children who regularly watch fast-paced programs such as cartoons, action/detective scenes, and even fast-paced educational programs may have difficulties learning in the calm and less actively stimulating environments of most public schools, as well as sustaining their attention for prolonged periods of time (Geist & Gibson, 2000; Zuckerman, et al., 1980). Therefore, educational shows such as *Dora the Explorer* would be less detrimental to preschooler behaviour as they aim at promoting school-like learning as opposed to shows such as *Spiderman* which are created strictly for entertainment.

Taken together, these findings propose that over the last three decades children have been engaged in an ever increasing amount of television viewing that affect cognition, language, learning, and behaviour. Although, in general, numerous television programs are fast-paced and negatively affect children's attention and behaviour, educational programs seem to teach skills necessary to prepare preschoolers for school by

introducing simple reading and math skills through child-directed speech. Accordingly, it is important to explore the relationship between television viewing and cognitive abilities such as attention, as well as behavioural characteristics such as aggression.

Television and attentional difficulties. Although several studies have suggested that viewing non-educational shows in early childhood appears to be a significant risk factor for subsequent development of attentional problems (Christakis et al., 2004; Zimmerman & Christakis, 2007), other researchers continue to explain this relationship in terms of other factors rendering such relationships non-causal (Miller et al., 2007). As such, this remains a hot topic in ADHD research with highly polarized views requiring further consideration.

On one side is the view expressed in the American Academy of Pediatrics (2001) policy statement. These authors recommended that children below two years of age should not engage in any television viewing because they should spend that time in interactive activities such as the ones contained in social exchanges, play, and language. Although there has not been concrete evidence presented in support of this argument, Rideout and Hamel (2006) confirmed that the electronic media is becoming a central focus of children's lives. Specifically, 40% of children live in households where the television is on most or all the time and 19% of preschoolers have a television set in their bedroom (Rideout & Hamel, 2006). An opposing argument in this debate posits that age-appropriate media for young children can be used to enhance learning and brain development (Ball & Bogatz, 1970; Geist & Gibson, 2000; Hooper & Chang, 1998). To further test this hypothesis, Christakis and colleagues (2004) drew data from the National Longitudinal Survey of Youth 1979 Children and Young Adults (NLSY-Child), with information obtained from both the child and the mother. This study included a number of

covariates such as gender, race/ethnicity, age of the child, gestational age at birth, maternal psychopathology, and maternal use of alcohol or tobacco during pregnancy. Results indicated that the amount of television hours watched per day at both ages one and three was associated with experiencing attentional problems at age seven (Christakis et al., 2004). More recently, Miller and colleagues (2007) reported similar correlational results with a wholly different interpretation. In this study, television viewing was significantly associated with objectively measured activity level and teacher reports of child activity level after adjusting for demographic variables. The assessment battery in this study used a more comprehensive assessment of ADHD behaviours. Although results suggested a relationship between television watching and ADHD-behaviours, these authors indicated that it is difficult to determine whether television viewing precedes these behavioural problems, or if it is the child's "difficult-to-manage" behaviour, as suggested by Barkley (1995), that increases the likelihood that parents will use television as a "surrogate baby sitter".

With a goal of furthering this research area, Zimmerman and Christakis (2007) conducted a study assessing how the relationship between early television viewing and subsequent attentional problems may be moderated by the type of content viewed. They studied three types of television content: educational, violent entertainment, and nonviolent entertainment shows. According to these authors, viewing non-educational shows before age three appears to be a significant risk factor for subsequent development of attentional problems (Zimmerman & Christakis, 2007). However, as mentioned earlier, these findings do not allow for causal inferences because different aspects of the environment, such as parenting, may interact or work in concert with television viewing (Barkley, 1995). Also, it is important to keep in mind that current evidence indicates that

a high proportion of ADHD symptoms appear to be accounted for by genes (Swanson et al., 2001).

Taken together, a large body of research suggests that engaging in excessive television watching that is highly reinforcing and requires minimal effortful processing has been correlated with attentional difficulties. However, the data on the causal direction of effects remains uncertain. It is possible that excessive television viewing at an early age is a significant risk factor for subsequent development of ADHD symptoms, but it is equally plausible that a child with attention problems is more likely to be encouraged to watch television or that there is a yet-to-be-identified moderating variable that may affect television viewing habits and attentional problems in young children. Further research is warranted.

Television and aggressive behaviour. Despite 50 years of research in the area of observation of aggression and aggressive behaviour, the reports have varied with respect to the link between media violence and aggression. However, since 1975, numerous cross-sectional studies, naturalistic studies, longitudinal studies, and several meta-analyses have provided evidence to suggest “cause-and-effect” relationship between media violence and real-life aggression (Dietz, & Strasburger, 1991; Huston et al., 1992). Moreover, the magnitude of and confidence in this relationship have been positive and increasing (Brame, Nagin, & Tremblay, 2001; Bushman & Anderson, 2001; Hogben, 1998; Paik & Comstock, 1994; Wood, Wong, & Chachere, 1991). Current studies have also found the amount of television viewing during early childhood to be a potential risk factor for the development of aggressive behaviour at a later age (Zimmerman et al., 2005). A more recent study by Christakis and Zimmerman (2007) furthered these findings by introducing the importance of content of television programs. They assessed whether

there is an association between exposure to violent television viewing at ages two to five years and antisocial behaviour at ages seven to ten years. Their primary predictor was exposure to the violent screen content and the primary outcome was membership in a group with high levels of antisocial behaviour. After adjusting for baseline behaviour problems, age, parental education, maternal depression, and cognitive and emotional support, there was a significant association between violent television programming and an increased risk for antisocial behaviour at a later age. This relationship was significant for boys, but not for girls (Christakis & Zimmerman, 2007). These authors postulated that male genetic predisposition toward aggression and socialization differences between boys and girls may account for the gender differences noted in the findings.

Overall, preschoolers tend to watch significant amounts of television and boys, in particular, appear to prefer non-educational cartoons. Although multiple studies seem to reveal a relationship between television viewing and attention problems, the interpretation of direction-of-effects is still unclear. Specifically, a group of authors have proposed that violent television viewing at a young age “causes” attentional difficulties at a later age (Christakis et al., 2004; Zimmerman & Christakis, 2007). In contrast, other researchers indicated that the correlation between the amount of television viewed and the attentional problems should be interpreted with care since other environmental factors such as parenting and preschoolers’ often challenging behaviour, as well as genetic risk may influence the findings (Miller et al., 2007). On the other hand, findings regarding the relationship between violent television viewing at a young age and subsequent aggressive behaviour are somewhat less ambiguous. In particular, numerous studies have found a significant association between violent television viewing during preschool and an increased risk for antisocial behaviour at a later age.

Differences between Canadian and American Families

A majority of the previously mentioned studies have been conducted outside of Canada, primarily in the United States. However, it should not be assumed that the findings from American samples generalize to the Canadian population as there are societal differences between the two countries (Burton and Phipps, 2007; McFarlane & Tedds, 2008; Wolfson, 1997). In order to better understand the effect that culture, institutional structures, and public policy may have on individual and family beliefs, practices, and decisions, it is important to recognise the differences and similarities in the social status, income, and money allocation across these two countries.

There are some similarities between Canada and the United States, including economic trends over time and a pattern of dropping personal savings rates in both countries (Chawla, 2007). Nevertheless, there continue to be numerous differences between these two countries. With respect to social status, American cities have large and dense areas of urban housing with multitudes of impoverished individuals not found in most Canadian cities (Bowman, 2000). Furthermore, the Canadian middle class is larger and more stable (Wolfson, 1997) when compared to the United States. In addition to being smaller, the American middle class has also been shrinking (Burkhauser, Cutts, Daly, & Jenkins, 1999) suggesting an expansion of the more polarized ends of the income spectrum. Although the U.S. economy appears to be better off in terms of total output per capita, families living in the United States are not necessarily better off in terms of disposable income when compared to their Canadian counterparts (Wolfson & Murphy, 1998).

The latest U.S. Census data indicates that the median household income across all U.S. households is \$48,451 (U.S. Census Bureau, 2007) and the median after-tax income

in Windsor, Ontario, specifically, is \$44,388 (Statistics Canada, 2007). Moreover, income is more dispersed among the lower quintiles in Canada (Picot & Myles, 1995) because of government transfer payments that yield increases in family income greater for the poorest (Statistics Canada, 2006), a pattern opposite to that seen in the U.S. (Bowman, 2000). Some examples of such payments are: (a) The Canadian Child Tax Credit for families with children under 18 years of age, (b) A Universal Child Care Benefit for the families with children under six years of age, and (c) The Children's Fitness Tax Credit associated with sporting activities intended to help kids stay physically active (Canada Revenue Agency, 2009).

Overall, Canada may be more economically supportive of families in general as there is less polarization of income overall, and the incomes of families at the lower end of the spectrum are higher when compared to American counterparts.

Purpose of the Proposed Research

Purpose. The goal of the current study is to investigate the relationship between the television viewing patterns among preschoolers and symptoms of ADHD, such as inattention, hyperactivity, and impulsivity, as well as aggression in a Canadian sample.

Research questions. As described in the review, there are several theories about the relationship between television viewing and ADHD, especially in young children. None of the extant research has included a Canadian sample. Thus, there are two research questions of the proposed research:

1. Do children at-risk of ADHD engage in more television viewing in general than their typically developing counterparts in a Canadian sample?
2. Is there an association between the amount of violent television viewing and attentional problems in a Canadian sample?

Hypotheses. The preceding research questions lead to the following hypotheses.

1. Previous research, conducted primarily in the United States, suggests that preschoolers at-risk for ADHD watch more television than their typically-developing peers. It is predicted that these findings will be replicated in a Canadian sample of preschoolers.
2. Studies conducted outside of Canada, primarily in the United States, report mixed findings regarding the relationship between the type of television viewed and subsequent behavioural problems, including inattention and aggression. It is predicted that preschoolers at-risk for ADHD will be more inattentive and more aggressive if there are higher levels of violence in their preferred television programs.

Support for these hypotheses would indicate that despite the presented differences in social underpinnings, such as the availability of subsidized daycare and an earlier school entrance in Canada, television remains an omnipresent influence in the lives of Canadian and American preschoolers. Furthermore, preschoolers at-risk for ADHD may benefit from having adults supervise the type and amount of television viewing in which they are engaged.

Chapter III

METHOD

Participants

As a part of a larger study on child behaviour and parent stress in preschoolers at-risk of ADHD, attempts were made to recruit participants from community preschools, parent magazines, and local public events likely to be attended by parents of young children. In exchange for participation in the recruitment process, preschools were offered educational sessions for teachers and parents on ADHD. Nevertheless, it was difficult to obtain an expected sample size and only 36 participants were recruited, 16 males and 20 females. Of the 36 children who participated, complete television data was available for 33 children. Participants were recruited in two groups: at-risk for ADHD and controls. Group status was determined based on parent and teacher ratings on the screening forms (ADHD-RS). At-risk participants ($n = 8$) had at least six symptoms reported by parent and/or teacher on the ADHD-RS. Control participants ($n = 25$) had fewer than three symptoms across raters.

Once parent's consent and child's informal verbal assent were obtained, the assessments were conducted. Parents received a brief report summarizing their child's performance along with a \$10 gift certificate to Chapters, sent approximately two weeks after the testing. If the child presented with severe ADHD symptoms, parents were given recommendations for reading materials and community-based services. During the final recruitment session at the mall, parents had an opportunity to enter a drawing for a \$25 gift certificate to Chapters. They obtained an additional chance at the draw if the teacher completed the same questionnaire. This separate draw for parents, for another \$25 gift

certificate, was established in order to increase participation by teachers completing the ADHD questionnaires and to amplify recruitment rates overall.

The children and their parents were all required to be English-speaking, however there were no gender or ethnic restrictions. Children diagnosed with mental retardation, a pervasive developmental disorder, a diagnosed neurological disorder (e.g. seizure disorder), or those who were medicated due to a chronic medical condition were excluded from participation. All parents were required to give informed consent for themselves and their child in order to participate. The mean age for the sample of children was 3.93 years ($SD = .53$; range = 3.08 – 4.92). The average social economic status was 49.97 ($SD = 18.0$, range = 16.00 – 119.51), reflecting generally middle-class socio economic status according to Nakao- Treas prestige scale (1990). Similarly, a dentist would obtain a score of 96, a kindergarten teacher a score of 57, a shoe sales worker a score of 40, and a cashier a score of 33 (Nakao & Treas, 1994). Among the participants and reflecting the local population, 78.8% of the children were non-Hispanic Caucasian, and 21.2% were of “other/mixed” ethnicity according to demographic data obtained from the parents. Mean estimated IQ, based on the Information subtest of the Wechsler Preschool and Primary Scales of Intelligence – Third Edition (WPPSI; Wechsler, 2002), was within the average range for the full sample ($M = 12.58$, $SD = 2.62$). An Information subtest score of 10 ($SD = 3$) was considered to be an average as well as an estimate of a FSIQ score of 100 ($SD = 15$); estimated $FSIQ \geq 80$ was required for inclusion in the study. A summary of demographics by group is contained in Table 1.

Measures

ADHD Rating Scale-IV (ADHD-RS). Parents and teachers were each asked to complete the ADHD-RS, an 18-item checklist (DuPaul et al., 1998), as part of the child’s

participation in the study. This information was used for identifying participants for the study and determining group status. This checklist is based on the ADHD symptoms listed in the DSM-IV. A 4-point scale (0 = not at all; 1 = just a little; 2 = pretty much; 3 = very much) was used to rate 18 ADHD behaviours over the last six months. Possible scores ranging from 0 to 54 were calculated by summing the ratings across the questions separately for each informant. DuPaul and colleagues (1998) reported that this type of checklist is a reliable and valid assessment tool for children with ADHD.

Medical and Developmental History Form. This form was developed by the primary investigator for the larger study. The intent of the form was to uniformly gather demographic information, as well as medical, developmental, and an educational history about the child. Parents completed this form as part of their measures with the larger study.

Television Viewing Questionnaire. This self-report measure was developed by Miller and colleagues (2007) based on the Time Diary Information from the PSID Child Development Supplement (CDS: Vandewater, Cummings, & Lee, 2005). It represented an expansion upon a measure used in many studies that assess television watching in preschoolers (Vandewater, Lee, & Shim, 2005). The original format of the questions asked only for the amount of time children watched television on the average weekday and weekend day. The expansion included information about favourite programs, time spent playing video and computer games, whether the family watches television as part of their time together, and how much the television is on during the day when the child is not watching. For the purposes of the present study, only those items about the amount of time and the preferred television programs were of interest.

Procedures

The present study was part of a larger study of child behaviour and parent stress in preschoolers with ADHD. Ethical approval was obtained from the University of Windsor Ethics Review Board (REB Approval #: 07-088). Participants were recruited from community preschools and community events using parent and teacher ADHD checklists (as previously described), and were then divided into two groups: those at-risk of developing ADHD and controls. Parental consent and informal verbal child assent were obtained prior to inclusion in the larger study.

The child and his/her parent were invited to participate in a brief assessment session. For the larger study (and beyond the scope of the present study), the child received a brief psycho-educational assessment comprised of the Block Design and Information subtests of the Wechsler Preschool and Primary Scale of Intelligence – Third Edition (WPPSI-III; Wechsler, 2002) and the first five subtests of Bracken school readiness test (Bracken & McCallum, 1998). During this one-hour/one-time visit, the parent completed multiple questionnaires, including the Television Viewing Questionnaire.

Based on data provided by parents via the television viewing questionnaire, the total average television viewing hours per day were determined, and a code for each preferred program was derived. Specifically, the average hours of television viewing per week day were multiplied by five and added to the average hours of television viewing per weekend day multiplied by two. This total was divided by seven to calculate the daily average television viewing.

The coding system for television content used was originally developed by Wright and colleagues (2005) and then later modified by Zimmerman and Christakis (2007). Two

independent coders categorized each program for genre and violence using the modified coding system. The initial interrater reliability for the genre was 0.63 and for the violence was 0.75. In the case that the coders did not agree, a third independent coder also coded the programs and a final code was established in conference. From the 21 genre codes (e.g., news, children's educational, reality show, etc.) and five types of violence (e.g. slapstick/comedic, sports, victimization, gratuitous, and ultra), three macro-categories were developed: educational programming without violence, entertainment only (no violence), and entertainment with violence (any violence). In order to calculate mean television content values across the three favourite programs a value with respect to the amount of violent content was assigned to each one of the three television shows listed. Specifically, educational programming without violence received a score of one, entertainment only without violence received a score of two, and entertainment with violence (any sort of violence) received a score of three. Finally, the total of these three scores was divided by three in order to obtain mean television content value for each participant.

All analyses were carried out using SPSS Version 17.0 (SPSS Inc., 2005).

Chapter IV

RESULTS

Preliminary Analyses.

A power analysis, conducted prior to data collection, indicated that for a medium effect size ($d = .50$; Zimmerman & Christakis, 2007), a total of 30 participants was needed in each group. Subsequent to data collection, descriptive statistics were calculated for all dependent variables (daily average television viewing and the level of violence in the child's preferred television program). Mean scores and standard deviations are reported in Table 1. All measures were examined for outliers, defined as those individuals with scores exceeding three standard deviations beyond the mean. None of the individuals met this criterion, and as a result all participants were included in data analyses.

Prior to conducting main analyses and in order to ensure the validity of the results, data were screened to make sure that no assumptions of normality and homogeneity of variance would be violated. Histograms, skewness, and kurtosis values were examined in order to determine whether assumption of the univariate normality was violated. Kolmogorov-Smirnov test was also calculated to assess the skewness and kurtosis. Although Kolmogorov-Smirnov value was significant for the two variables that measured the average number of hours of television watched per day ($.171, p < .05$) and the amount of violence in the child's preferred television program ($.262, p < .05$), it was found that neither of the two dependent variables was skewed or kurtotic (using the standard of absolute values not being greater than 2). Consequently, the data were not transformed to correct for non-normality. Finally, it was concluded that all variables met the assumption of the homogeneity of variance as a result of the non-significant Levene's statistic.

Main Analyses

Hypothesis 1. To test the hypothesis that preschoolers at-risk for ADHD watch more television than typically-developing peers, a one-way analysis of variance (ANOVA) was conducted where the dependent variable was the average number of hours of television watched per day. The independent variable was group (control or at-risk). Levene's test supported the assumption of homogeneity of variance, across groups for the dependent variable. ANOVA showed that group membership does not have a significant effect on the average number of hours of television watched per day, $F(1, 32) = .351, p > .05$, partial $\eta^2 = .011$, with a small effect size.

Hypothesis 2. To test the hypothesis that children at-risk for ADHD will exhibit more ADHD symptoms if their preferred television programs include violence, a one-way analysis of variance (ANOVA) was conducted with one continuous dependent variable. The dependent variable measured the amount of violence the child's preferred television program contains ranging from none (educational programming scored as one) to violence present (entertainment programming with violence scored as three). The independent variable was group (control or at-risk). Levene's test supported the assumption of homogeneity of variance, across groups for the dependent variable. ANOVA showed that group membership does not have a significant effect on the amount of violence the child's preferred television program contains, $F(1, 32) = .701, p > .05$, partial $\eta^2 = .022$, with a small effect size.

Chapter V

DISCUSSION

Review of Primary Research Questions

The purpose of this research study was to investigate the relationship between the television viewing patterns among preschoolers and symptoms of ADHD in a Canadian sample. Although there are several theories about the relationship between ADHD and television viewing, none of the current research has included a Canadian sample. Consequently, the goal of this study was to compare the television viewing patterns of preschoolers presenting with symptoms of ADHD to controls and in a Canadian sample. Parent and teacher reports were used to examine these relationships.

A preschool-aged sample was chosen for several reasons. First, it has been shown that behavioural difficulties during the preschool age are often predictive of behavioural difficulties at school age and beyond (Campbell, 2000). Second, although ADHD is largely heritable (Swanson et al., 2001), sizeable literature exists on early environmental influences associated with ADHD (Campbell, 1994; Cunningham & Boyle, 2002) such as perinatal problems (Nomura et al., 2008) and the interplay of parent and child behaviour (Shaw et al., 1998). However, there are conflicting findings regarding the effects of television viewing at this age (Christakis et al., 2004; Miller, Knezevic, & Halperin, 2009; Zimmerman & Christakis, 2007). Finally, the preschool years are a time when neurodevelopmental processes such as synaptic pruning and dendritic arborization, which are highly experience-dependent, take place. Therefore, it may not be surprising to find adverse effects of television viewing on cognitive development in young children.

Past research suggested that young children engage in approximately three hours of television viewing on average each day (Huston & Wright, 1997; Rideout et al., 1999)

and that they are often exposed to high levels of non-educational television programming that can have negative effects on cognition (Geist & Gibson, 2007), learning (Hooper & Chang, 1998), language, and behaviour (Zimmerman & Christakis, 2007). Past research has also reported an association between television viewing patterns among preschoolers and inattention, aggressive behaviour, and ADHD diagnosis (Christakis et al., 2004; Christakis & Zimmerman, 2007; Miller et al., 2007; Zimmerman & Christakis, 2007; Zimmerman et al., 2005). Hence, similar results were expected in this study of preschoolers at-risk of ADHD.

Review of Findings

The results were in contrast to previously reported relationships between television viewing and symptoms of ADHD (Christakis et al., 2004; Zimmerman & Christakis, 2007) and in agreement with recently presented findings by Miller, Knezevic, and Halperin (2009). Although sample size limitations did not allow for group comparisons, extremely small effect sizes suggest that television viewing was not significantly associated with ADHD group membership.

Hypothesis one stated that preschoolers at-risk of ADHD watch more television than their typically-developing peers. It was expected that preschoolers at-risk of ADHD would watch higher rates of daily television viewing. There was, however, no significant group mean difference in amount of television watched as reported by the parents of the at-risk children and the parents of the controls. Specifically, preschoolers at-risk of ADHD were not found to engage in more television viewing. These findings suggest that there is no significant relationship between the amount of television viewed during the preschool years and ADHD symptoms, although a small sample size may have limited the power necessary to detect significant associations.

Hypothesis two stated that preschoolers at-risk of ADHD would watch television programs with higher levels of violence as compared to controls. Data did not support this hypothesis. Group membership did not have a significant effect on the amount of violence in children's preferred television programs. As such, these findings indicate that the content of the programming is not significantly related to children's ADHD symptoms as reported by parents and teachers. As with the first hypothesis, small sample size may have limited the power necessary for significant differences between groups.

Taken together, the goal of this study was to address the omnipresent nature of television in the lives of young children and its possible effects on child behaviour. In contrast to earlier research findings from the United States, this study suggests that viewing television programming with elements of violence is not related to behavioural outcomes in Canadian children at-risk of ADHD. These findings are in line with recently presented data collected from a highly urbanized and diverse sample in the United States which concluded that, in general, television content viewed by preschoolers does not affect externalizing behaviours (Miller et al., 2009).

In order to determine the underpinnings of the findings of the present study, it is important to recall that current evidence indicates that ADHD is predominantly heritable (Swanson et al., 2001). Although synaptic pruning and dendritic arborization are highly experience dependent and therefore it may not be surprising to find adverse effects of violent television viewing on child's cognitive development, the early onset of ADHD and the high proportion of variance in ADHD symptoms accounted for by genetic inheritance make it unlikely that television viewing plays a significant role in the emergence of ADHD. Results from the present study suggest that television may not play

the significant role in early childhood behaviour posited by other researchers (Christakis et al., 2004; Zimmerman & Christakis, 2007).

Another possibility for the discrepant findings is that perhaps there are additional child and parent variables that should have been considered in the previous research studies. Parenting children at-risk of ADHD may be a challenging task due to their often difficult-to-manage behaviours, such as difficulty remaining seated, playing quietly, and/or awaiting their turn. Additionally, ADHD is highly heritable and parents of children with ADHD are at an increased risk for an ADHD diagnosis themselves. As previously mentioned, parents with higher levels of ADHD symptoms have been found to report lower levels of positive parenting. Also, it is well known that children with ADHD are highly responsive to continuous reinforcement (Wigal et al., 1998) and television tends to be highly reinforcing, with minimal requirements of effortful processing (Schiffrin & Schneider, 1984). Therefore, the association between television viewing and reports of behavioural difficulties associated with ADHD found in earlier longitudinal research must be interpreted with care. Specifically, parents of preschoolers at-risk of ADHD may be more likely to use television as a “surrogate baby sitter” in order to complete their daily chores (Barkley, 1995) as they may lack the skills and patience necessary to parent their often demanding child. Perhaps, the previously reported relationship between the amount and type of television viewed and the symptoms of ADHD was confounded by other factors such as child’s often difficult-to-manage behaviour, parents’ diagnoses, parents’ stress levels, as well as parenting strategies that should be accounted for in the future research.

Finally, the findings of this study are difficult to generalize due to a small sample size. However, they are similar to those of the recent longitudinal study conducted with

an American sample of preschoolers (Miller et al., 2009) and as such should not be ignored. Miller and colleagues (2009) employed a highly urbanized, diverse, and large sample of preschoolers, reporting that the content of preferred television programming was not associated with increased attention difficulties or aggression at baseline or one-year later. They concluded that it does not appear that the content of programming plays a significant role in behavioural difficulties (Miller et al., 2009). These authors were able to obtain information about the child's behaviour from parents and teachers therefore employing a more comprehensive measures of ADHD behaviours than the ones used in the prior studies. Similar measures were also utilized in this project. Taken together, the findings from these two studies clearly indicate lack of association between the type of television viewing and reports of ADHD symptoms.

Limitations

Despite the strengths of the present study, including the gathering of data directly from parents and teachers, there are several limitations inherent in the current research. Most notably, the sample size is extremely small with a small cell size for the at-risk group. As such, had the sample size been increased, different findings may have come to light or the current ones would have been more generalizable. Due to the limited sample size in the present study, the observed power was very low and therefore, had an effect been present, there most likely was not enough power to detect it. Consequently, there may be inflated Type II error in the present study.

Another limitation of the current study is related to the measures used. First, all television data was reported by the parents. Since teachers, physicians, and other professionals often encourage parents to seek out engaging activities for their children other than television viewing, parents may tend to underreport the amount of time the

child spends watching television or their preferred television programs. Future research should strive to include other measures of preschoolers' television viewing patterns, such as using home video cameras to capture television viewing more objectively.

Finally, despite the growing similarities in the net personal consumption between Canadian and American households (Chawla, 2007; Torrey and Jacobs, 1993), income seems to be more dispersed among the lower quintiles in Canada (Picot & Myles, 1995) unlike in America. As a result of this more abundant Canadian support network for the lower class, there may be some inherent differences that may make it impractical to simply compare and contrast the family dynamics of these two countries. Specifically, Canadian parents may be less often stressed due to financial issues and may have more chances to engage in outdoor activities with their children. Consequently, role of television in the lives of Canadian preschoolers may be significantly different as compared to the American families. In the future, research should be conducted using a Canadian sample of preschoolers in order to increase the understanding of the role of television in Canada.

Clinical Implications

The current study has important implications for the field of psychology. Most notably, the findings of this study highlight the need for future research involving television viewing during the preschool years using a Canadian sample. Although the results of this study confirm previous findings that television viewing takes up a significant amount of preschoolers' time daily and the American Academy of Pediatrics has suggested that television should be viewed as problematic, this study does not suggest that television content significantly influences externalizing behaviours for most children. Consequently, the topic of whether television should be viewed as a negative

environmental influence should continue to be addressed in the future research as an important environmental factor. Nevertheless, parents should consider balancing out the amount of time children spend watching television and engaging in imaginative play and social interactions with other children. Finally, by engaging in dynamic discussions about television content with their children, parents could obtain a better understanding of how their children perceive current television programming, in particular the presented violence. As a result, they may be able to provide additional guidance and enhance their child's learning experience.

Future Directions

Based on the findings and limitations of the present study, several recommendations can be made for future research. As previously mentioned, although studies have shown that children may learn numerous skills from educational shows such as *Sesame Street*, they are also exposed to high levels of non-educational television programming that can have negative effects on children's cognition (Geist & Gibson, 2000), learning (Hooper & Chang, 1998), language, and behaviours (Zimmerman & Christakis, 2007). Therefore, most importantly, it is essential that future studies continue to investigate further the relationship between television viewing patterns and more generalized child behaviour. Second, studies should include bigger sample sizes to allow better generalizability of findings. Third, the television questionnaire could be expanded to include additional information such as whether the child watches television at school or daycare or during other out-of-home activities, the time of day when the television viewing mostly occurs, and the number of television sets in the household. As a result, such information would allow the researchers to better understand the availability of television in a household and the validity of parental reports.

Finally, future research should continue to examine the potential effects of the various risk factors, social support, parenting stress, and parenting behaviours that may interact with child's television viewing patterns. Specifically, researchers should collect data regarding the activities the family engages in (other than television viewing), the amount of time they collectively or separately engage in each one, the activities specific to the preschoolers that the child spends time doing, as well as levels of stress the parents are reporting and the amount of time they have available to spend with their child each day. Consequently, researchers would be able to control for these potentially confounding variables as well as obtain a clearer picture of the family dynamic.

Conclusions

In summary, this study has found that in general television content viewed by preschoolers is not associated with attentional problems. Although the results are not generalizable due to an extremely small sample size, the findings benefit the growing and conflicting research on television viewing at an early age. There would be an additional benefit of such a study if further research, with a much larger sample size, is conducted to account for potentially confounding variables such as parenting and child characteristics in order to provide parents with clear guidance regarding appropriate television exposure and the impact it may or may not have on their preschoolers' development.

References

- Alessandri, S. M. (1992). Attention, play, and social behavior in ADHD preschoolers. *Journal of Abnormal Child Psychology, 20*, 289-302.
- Amara, S. G., & Kuhar, M. J. (1993). Neurotransmitter transporters: Recent progress. *Annual Review of Neuroscience, 16*, 73-93.
- Amato, P. R. (2000). The consequences of divorce for adults and children. *Journal of Marriage and the Family, 62*, 1269-1287.
- American Academy of Pediatrics. (2001). Children, adolescents, and television. Committee on public education. *Pediatrics, 107*(2), 423-426.
- American Psychiatric Association. (1994). *Diagnostic and Statistical Manual of Mental Disorders (4th ed.)*. Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed. rev.)*. Washington, DC: American Psychiatric Association.
- Arnsten, A. F., Steere, J. C., & Hunt, R. D., (1996). The contribution of alpha 2-noradrenergic mechanisms of prefrontal cortical cognitive function. Potential significance for attention-deficit hyperactivity disorder. *Archives of General Psychiatry, 53*, 448-455.
- August, G. J., Braswell, L., & Thuras, P. (1998). Diagnostic stability of ADHD in a community sample of school-aged children screened for disruptive behaviour. *Journal of Abnormal Child Psychology, 26*, 345-356.
- Ball, S., & Bogatz, G. A. (1970). A summary of the major findings in "The first year of Sesame Street: An evaluation". *US Department of Health Education & Welfare National Institute of Education*. Princeton, NJ: Educational Testing Services.

- Barkley, R. A. (1995). Is there an attention deficit in ADHD? In R. A. Barkley (Ed.), *The ADHD Report*, 3, 1-4. New York: Guilford Press.
- Barkley, R. A. (1998). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York: The Guilford Press.
- Barkley, R. A. (2000). *Taking charge of ADHD* (rev. ed.) New York: The Guilford Press.
- Barkley, R. A. (2002). Major life activity and health outcomes associated with attention-deficit/hyperactivity disorder. *Journal of Clinical Psychiatry*, 63, 10-15.
- Barkley, R. A., Anastopoulos, A. D., Guevremont, D. C., & Fletcher, K. E. (1992). Adolescents with attention deficit hyperactivity disorder: Mother-adolescent interactions, family beliefs and conflicts, and maternal psychopathology. *Journal of Abnormal Child Psychology*, 20, 263-288.
- Barkley, R. A., & Cunningham, C. E. (1979). The effects of methylphenidate on the mother-child interactions of hyperactive children. *Archives of General Psychiatry*, 36, 201-208.
- Barkley, R. A., Fischer, M., Edelbrock, C. S., & Smallish, L. (1990). The adolescent outcome of hyperactive children diagnosed by research criteria, I: An 8-year perspective follow-up study. *Journal of the American Academy of Child and Adolescent Psychiatry*, 41, 319-332.
- Barkley, R. A., Fischer, M., Edelbrock, C. S., & Smallish, L. (1991). The adolescent outcome of hyperactive children diagnosed by research criteria: III. Mother-child interactions, family conflicts and maternal psychopathology. *Journal of Child Psychology and Psychiatry*, 32, 233-255.

- Barkley, R. A., Fischer, M., Smallish, L., & Fletcher, K. (2002). The persistence of attention-deficit/hyperactivity disorder into a young adulthood as a function of reporting source and definition of disorder. *Journal of Abnormal Psychology, 111*, 279-289.
- Barkley, R. A., Karlson, J., Pollard, S., & Murphy, J. (1985). Developmental changes in the mother-child interactions of hyperactive boys: Effects of two dose levels of Ritalin. *Journal of Child Psychology and Psychiatry, 26*, 705-715.
- Barr, C. L., Feng, Y., Wigg, K., Bloom, S., Roberts, W., Malone, M., et al. (2000a). Identification of DNA variants in the SNAP-25 gene and linkage study of these polymorphisms and attention-deficit hyperactivity disorder. *Molecular Psychiatry, 5*, 405-409.
- Barr, C. L., Feng, Y., Wigg, K., Roberts, W., Malone, M., Schachar, R., et al. (2000b). Identification of polymorphisms in GABA_B receptor gene and linkage study of attention-deficit hyperactivity disorder. *Gene Function and Disease, 1*, 194-201.
- Barr, C. L., Shulman, R., Wigg, K., Schachar, R., Tannock, R., Roberts, W., et al. (2001a). Linkage study of polymorphism in the gene for myelin oligodendrocyte glycoprotein located on chromosome 6p and attention deficit hyperactivity disorder. *American Journal of Medical Genetics, 105*, 250-254.
- Barr, C. L., Xu, C., Kroft, J., Feng, Y., Wigg, K., Zai, G., et al. (2001b). Haplotype study of three polymorphisms at the dopamine transporter locus confirm linkage to attention-deficit hyperactivity disorder. *Biological Psychiatry, 49*, 333-339.
- Baumrind, D. (1966). Effects of authoritative parental control on child behaviour. *Child Development, 37*, 887 – 907.

- Beitchman, J. H., Davidge, K. M., Kennedy, J. L., Atkinson, L., Lee, V., Shapiro, S., & Douglas, L. (2003). The serotonin transporter gene in aggressive children with and without ADHD and nonaggressive matched controls. *Annals of the New York Academy of Sciences, 1008*, 248-251.
- Bidwell, L. C., Willcutt, E. G., DeFries, J. C., & Pennington, B. F. (2007). Testing for neuropsychological endophenotypes in siblings discordant for attention-deficit/hyperactivity disorder. *Biological Psychiatry, 69*, 991-998.
- Biederman, J. (1998). Attention-deficit/hyperactivity disorder: A life span perspective. *Journal of Clinical Psychiatry, 59*, 4-16.
- Biederman, J., Faraone, S. V., Keenan, K., Benjamin, J., Krifcher, B., Moore, C., et al. (1992). Further evidence for family-genetic risk factors in attention deficit hyperactivity disorder: Patterns of comorbidity in probands and relatives psychiatrically and pediatrically referred samples. *Archives of General Psychiatry, 49*, 728-738.
- Biederman, J., Mick, E., & Faraone, S. V. (2000). Age-dependent decline of symptoms of attention deficit hyperactivity disorder: Impact of remission definition and symptom type. *American Journal of Psychiatry, 157*, 816-818.
- Bowlby, J. (1969). *Attachment and loss: Vol. I., Attachment*. New York: Basic Books.
- Bowman, M. L. (2000). The diversity of diversity: Canadian-American differences and their implications for clinical training and APA accreditation. *Canadian Psychology, 41*, 230-243.
- Bracken, & McCallum (1998). Universal Nonverbal Intelligence Test.

- Brame, B., Nagin, D. S., & Tremblay, R. E. (2001). Developmental trajectories of physical aggression from school entry to late adolescence. *The Journal of Child Psychology and Psychiatry, 42*, 503-512.
- Bull, R., Espy, K. A., & Wiebe, S. A. (2008). Short-term memory, working memory, and executive functioning in preschoolers: Longitudinal predictors of mathematical achievement at age 7 years. *Developmental Neuropsychology, 33*, 205-228.
- Burkhauser, R. V., Cutts, A. C., Daly, M., & Jenkins, S. P. (1999). Testing the significance of income distribution changes over the 1980s business cycle: A cross-national comparison. *Journal of Applied Economics, 14*, 253-272.
- Burton, P., & Phipps, S. (2007). Families, time and money in Canada, Germany, Sweden, the United Kingdom and the United States. *Review of Income and Wealth, 53*, 460-483.
- Bushman, B. J., & Anderson, C. A. (2001). Media violence and the American public: Scientific facts versus media misinformation. *American Psychologist, 56*, 477-489.
- Bussing, R., Grudnik, J., Mason, D., Wasiak, M., & Leonard, C. (2002). ADHD and conduct disorder: An MRI study in community sample. *World Journal of Biological Psychiatry, 3*, 216-220.
- Byrne, J., DeWolfe, N., & Bawden, H. (1998). Assessment of attention deficit hyperactivity disorder in preschoolers. *Child Neuropsychology, 4*, 49-66.
- Cadore, R. J., Stewart, M. A., (1991). Ad adoption study of attention deficit/hyperactivity/aggression and their relationship to adult antisocial personality. *Comprehensive Psychiatry, 32*, 73-82.
- Campbell, S. B. (1990). *Behavior problems in preschool children*. New York: Guilford Press.

- Campbell, S. B. (1994). Hard-to-manage preschool boys: externalizing behavior, social competence, and family context at two-year follow-up. *Journal of Abnormal Child Psychology*, 22, 147-166.
- Campbell, S. B. (2002). *Behavior problems in preschool children: Clinical and developmental issues* (2nd ed.). New York: The Guilford Press.
- Campbell, S. B., Breaux, A. M., Ewing, L. J., & Szumowski, E. K. (1984). A one-year follow-up of parent-identified behavior problem toddlers. *Journal of the American Academy of Child Psychiatry*, 23, 243-249.
- Campbell, S. B., Ewing, L. J., Breaux, A. M., & Szumowski, E. K. (1986). Parent-identified behavior problem toddlers: Follow-up at school entry. *Journal of Child Psychology and Psychiatry*, 27, 473-488.
- Campbell, S. B., March, C. L., Pierce, E., Ewing, L. J., & Szumowski, E. K. (1991). Hard-to-manage preschool boys: family context and the stability of externalizing behavior. *Journal of Abnormal Child Psychology*, 3, 175-190.
- Campbell, S. B., Pierce, E., March, C., Ewing, L. J., & Szumowski, E. K. (1994). Hard-to-manage preschool boys: symptomatic behavior across contexts and time. *Child Development*, 65, 836 – 851.
- Campbell, S. B., Szumowski, E. K., Ewing, L. J., Gluck, D. S., & Breaux, A. M. (1982). A multidimensional assessment of parent-identified behavior problem toddlers. *Journal of Abnormal Child Psychology*, 10, 569-592.
- Canada Revenue Agency. (2009). <http://www.cra-arc.gc.ca/bnfts/menu-eng.html>.

- Carte, E. T., Nigg, J. T., & Hinshaw, S. P. (1996). Neuropsychological functioning, motor speed, and language processing in boys with and without ADHD. *Journal of Abnormal Child Psychology*, 24, 481-498.
- Castellanos, F. X., Giedd, J. N., Berquin, P. C., Walter, J. M., Sharp, W., Tran, T., et al. (2001). Quantitative brain magnetic resonance imaging in girls with attention – deficit/hyperactivity disorder. *Archives of General Psychiatry*, 58, 289-295.
- Castellanos, F. X., Lee, P. P., Sharp, W., Jeffries, N. O., Greenstein, D. K., Clasen, L. S., et al. (2002). Developmental trajectories of brain volume abnormalities in children and adolescents with attention-deficit/hyperactivity disorder. *Journal of the American Medical Association*, 288, 1740-1748.
- Castellanos, F. X., Sharp, W. S., Gottesman, R. F., Greenstein, Giedd, & Rapoport, J. L. (2003). Anatomic brain abnormalities in monozygotic twins discordant for attention deficit hyperactivity disorder. *The American Journal of Psychiatry*, 160, 1693-1696.
- Certain, L. K., & Kahn, R. S. (2002). Prevalence, correlates, and trajectory of television viewing among infants and toddlers. *Pediatrics*, 109, 634-642.
- Chawla, R. K. (2007). Spending patterns in Canada and the U.S. *Perspectives on Labour and Income*, 19, 21-30.
- Christakis, D. A., Ebel, B. E., Rivara, F. P., & Zimmerman, F. J. (2004). Television, video, and computer game usage in children under 11 years of age. *Journal of Paediatrics*, 145, 652-656.
- Christakis, D. A., & Zimmerman, F. J. (2007). Violent television viewing during preschool is associated with antisocial behaviour during school age. *Pediatrics*, 120, 993-999.

- Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics*, *113*, 708-713.
- Chronis, A. M., Lahey, B. B., Pelham, W. E., Kipp, H. L., Baumann, B. L., & Lee, S. S. (2003). Psychopathology and substance abuse in parents of young children with ADHD. *Journal of the American Academy of Child and Adolescent Psychiatry*, *24*, 1424-1432.
- Chronis, A., Raggi, V. L., Clarke, T. L., Rooney, M. E., Diaz, Y., & Pian, J. (2008). Association between maternal attention-deficit/hyperactivity disorder symptoms and parenting. *Journal of Abnormal Child Psychology*, *36*, 1237-1250.
- Colman, R. A., Hardy, S. A., Albert, M., Raffaelli, M., & Crockett, L. (2006). Early predictors of self-regulation in middle childhood. *Infant and Child Development*, *15*, 421-437.
- Comings, D. E., Gade-Andavolu, R., Gonzalez, N., Blake, H., Wu, S., & MacMurray, J. P. (1999a). Additive effect of three nonadrenergic genes (ADRA2a, ADRA2C, DBH) on attention-deficit hyperactivity disorder and learning disabilities in Tourette syndrome subjects. *Clinical Genetics*, *55*, 160-172.
- Comings, D. E., Gonzalez, N., Wu, S., Gade, R., Muhleman, D., Saucier, G., et al. (1999b). Studies of the 48 bp repeat polymorphism of the DRD4 gene in impulsive, compulsive, addictive behaviors: Tourette syndrome, ADHD, pathological gambling, and substance abuse. *American Journal of Medical Genetics*, *88*, 358-368.
- Comstock, G. A. (1991). *Television and the American child*. Orlando, FL: Academic.

- Comstock, G. A., & Paik, H. (1991). *Television and the American child*. San Diego, CA: Academic Press.
- Counts, C. A., Nigg, J. T., Stawicki, J. A., Rappley, M. D., & Von Eye, A. (2005). Family adversity in DSM-IV ADHD combined and inattentive subtypes and associated disruptive behaviour problems. *Journal of the American Academy of Child and Adolescent Psychiatry, 44*, 690-698.
- Cox, M. J., & Paley, B. (1997). Families as systems. *Annual Review of Psychology, 48*, 243-267.
- Creasey, G., & Reese, M. (1996). Mothers' and fathers' perceptions of parenting hassles: Associations with psychological symptoms, nonparenting hassles, and child behaviour problems. *Journal of Applied Developmental Psychology, 17*, 393-406.
- Crnic, K. A., Gaze, C., & Hoffman, C. (2005). Cumulative parenting stress across the preschool period: Relations to maternal parenting and child behaviour at age 5. *Infant and Child Development, 14*, 117-132.
- Crnic, K. A., & Greenberg, M. T. (1990). Minor parenting stresses with young children. *Child Development, 61*, 1628-1637.
- Cunningham, C. E., & Barkley, R. A. (1979). The interaction of normal and hyperactive children with their mothers their in free play and structured tasks. *Child Development, 50*, 217-224.
- Cunningham, C. E., & Boyle, M. H. (2002). Preschoolers at risk for attention-deficit hyperactivity disorder and oppositional defiant disorder: Family, parenting, and behavioral correlates. *Journal of Abnormal Child Psychology, 30*, 555-569.

- Deater-Deckard, K., Dodge, K. A., Bates, J. E., Pettit, G. S. (1998). Multiple risk factors in the development of externalizing behaviour problems: Group and individual differences. *Development and Psychopathology, 10*, 469-493.
- Demaray, M. K., Schaefer, K., & Delong, L. K. (2003). Attention-deficit/hyperactivity disorder (ADHD): A national survey of training and current assessment practices in the schools. *Psychology in the Schools, 40*, 583-597.
- DeWolfe, N. A., Byrne, J. M., & Bawden, H. N. (2000). Prechool inattention and impulsivity-hyperactivity: Development of a clinical based assessment protocol. *Journal of Attention Disorders, 4*, 80-90.
- Diamond, A., & Kirkham, N. (2005). Not quite as grown-up as we like to think: Parallels between cognition in childhood and adulthood. *Psychological Science, 16*, 291-297.
- Dietz, W. H., & Strasburger, V. C. (1991). Children, adolescents, and television. *Current Problems in Pediatrics, 21*, 8-31.
- DuPaul, G.J, McGoey, K.E., Eckert, T.L., & Vanbrakle, J. (2001). Preschool children with attention deficit/hyperactivity disorder: Impairments in behavioral, social, and school functioning. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*(5), 508-515.
- DuPaul, 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.
- Durston, S., Hulshoff, H. E., Schnack, H. G., Buitelaar, J. K., Steenhuis, M. P., Minderaa, R. B., et al. (2004). Magnetic resonance imaging of boys with attention-

- deficit/hyperactivity disorder and their unaffected siblings. *Journal of the American Academy of Child and Adolescent Psychiatry*, 43(3), 332-340.
- Eisenberg, J., Mei-Tal, G., Steinberg, A., Tartakovsky, E., Zobar, A., Gritsenko, I., et al. (1999). Haplotype relative risk study of catechol-O-methyltransferase (COMT) and attention deficit hyperactivity disorder (ADHD): Association of the high-enzyme activity Val allele with ADHD impulsive-hyperactive phenotype. *American Journal of Medical Genetics*, 88, 497-502.
- Espy, K. A. (1997). The shape school: Assessing executive function in preschool children. *Developmental Neuropsychology*, 13, 495-499.
- Espy, K. A., & Bull, R. (2005). Inhibitory processes in young children and individual variation in short-term memory. *Developmental Neuropsychology*, 28, 669-688.
- Espy, K. A., Senn, T. R., & Kaufmann, P. M. (2001). The organization of executive functions in preschool children. *Clinical Neuropsychologist*, 15, 254.
- Espy, K. A., Kaufmann, P. M., McDiarmid, M. D., & Glisky, M. L. (1999). Executive functioning in preschool children: Performance on A-not-B and other delayed response format tasks. *Brain and Cognition*, 41, 178-199.
- Faraone, S. V., & Biederman, J. (1998). Neurobiology of attention-deficit hyperactivity disorder. *Biological Psychiatry*, 44, 951-958.
- Faraone, S. V., Biederman, J., Keenan, K., & Tsuang, M. T. (1991). Separation of DSM-III attention deficit disorder and conduct disorder: Evidence from a family-genetic study of American child psychiatry patients. *Psychological Medicine*, 21, 109-121.
- Faraone, S. V., Biederman, J., Mick, E., Williamson, S., Wilens, T., Spencer, T., et al. (2000). Family study of girls with attention deficit hyperactivity disorder. *American Journal of Psychiatry*, 157, 1077-1083.

- Faraone, S. V., Doyle, A. E., Mick, E., & Biederman, J. (2001). Meta-analysis of the association between the 7-repeat allele of the dopamine D₄ receptor gene and attention deficit hyperactivity disorder. *American Journal of Psychiatry*, *158*(7), 1052-1057.
- Faraone, S. V., Perlis, R. H., Doyle, A. E., Smoller, J. W., Goralnick, J. J., Holmgren, M. A., et al. (2005). Molecular genetics of attention-deficit/hyperactivity disorder. *Biological Psychiatry*, *57*, 1313-1323.
- Fischer, M. (1990). Parenting stress and the child with attention deficit hyperactivity disorder. *Journal of Clinical Child Psychology*, *19*, 337-346.
- Filipek, P. A., Semrud-Clikeman, M., Steingard, R. J., Renshaw, P. F., Kennedy, D. N., & Biederman, J. (1997). Volumetric MRI analysis comparing subjects having attention-deficit hyperactivity disorder with normal controls. *Neurology*, *48*, 589-601.
- Flavell, J. H. (1999). Cognitive development: Children's knowledge about the mind. *Annual Review of Psychology*, *50*, 21-45.
- Flory, K., Milich, R., Lynam, D. R., Leukefeld, C., & Clayton, R. (2003). Relation between childhood disruptive behaviour disorders and substance use and dependence symptoms in young adulthood: Individuals with symptoms of attention-deficit/hyperactivity disorder and conduct disorder are uniquely at risk. *Psychology of Addictive Behaviors*, *17*, 151-158.
- Friedrich, L. K., & Stein, A. H. (1973). Aggressive and prosocial television programs and the natural behaviour of preschool children. *Monographs of the Society for Research in Child Development*, *38*, 1-64.

- Funk, J. B., Germann, J. N., & Buchman, D. D. (1997). Children and electronic games in the United States. *Trends in Communications*, 2, 111-126.
- Gainetdinov, R. R., Wetsel, W. C., Jones, S. R., Levin, E. D., Jaber, M., & Caron, M. G. (1999). Role of serotonin in the paradoxical calming effect of psychostimulants on hyperactivity. *Science*, 283, 397-401.
- Geist, E. A., & Gibson, M. (2000). The effect of network and public television programs on four and five year olds ability to attend to educational tasks. *Journal of Instructional Psychology*, 27, 250-261.
- Gittelman, R., Manuzza, S., Shenker, R., & Bonagura, N. (1985). Hyperactive boys almost grown up. I: Psychiatric status. *Archives of General Psychiatry*, 42, 937-947.
- Gordon, M., Antshel, K., Faraone, S., Barkley, R. A., Lewandowski, L., Hudziak, J., et al. (2006). Symptoms versus impairment: The case for respecting DSM-IV's criterion D. *Journal of Attention Disorders*, 9, 465-475.
- Greenhill, L. L., Posner, K., Vaughan, B. S., & Kratochvil, C. J. (2008). Attention deficit hyperactivity disorder in preschool children. *Child and Adolescent Psychiatric Clinics of North America*, 17, 347-366.
- Halperin, J. M., Newcorn, J. H., Schwartz, S. T., Sharma, V., Siever, L. J., Koda, V. H., et al. (1997). Age-related changes in the association between serotonergic function and aggression in boys with ADHD. *Biological Psychiatry*, 41, 682-689.
- Hawi, Z., Lowe, N., Kirley, A., Gruenhage, F., Nothen, M., Greenwood, T., et al. (2003). Linkage disequilibrium mapping at DAT1, DRD5, and DBH narrows the search for ADHD susceptibility alleles at these loci. *Molecular Psychiatry*, 8, 299-308.
- Hawi, Z., Millar, N., Daly, G., Fitzgerald, M., & Gill, M. (2000). No association between catechol-O-methyltransferase (COMT) gene polymorphism and attention deficit

- hyperactivity disorder (ADHD) in an Irish sample. *American Journal of Medical Genetics*, 96, 282-284.
- Healey, D. M., Miller, C. J., Casatelli, K. L., Marks, D. J., & Halperin, J. M. (2008). The impact of impairment criteria on rates of ADHD diagnoses in preschoolers. *Journal of Abnormal Child Psychology*, 36, 771-778.
- Henricsson, L., & Rydell, A. M. (2006). Children with behaviour problems: The influence of social competence and social relations on problem stability, school achievement and peer acceptance across the first six years of school. *Infant and Child Development*, 15, 347-366.
- Hill, D. E., Yeo, R. A., Campbell, R. A., Hart, B., Vigil, J., & Brooks, W. (2003). Magnetic resonance imaging correlates of attention-deficit/hyperactivity disorder in children. *Neuropsychology*, 17, 496-506.
- Hogben, M. (1998). Factors moderating the effect of television aggression on viewer behaviour. *Communication Research*, 25, 220-247.
- Hooper, M. L., & Chang, P. (1998). Comparison of demands of sustained attentional events between public and private children's television programs. *Perceptual and Motor Skills*, 86, 431-434.
- Houghton, S., Douglas, G., West, J., Whiting, K., Wall, M., Langsford, S., et al. (1999). Differential patterns of executive function in children with attention-deficit hyperactivity disorder according to gender and subtype. *Journal of Child Neurology*, 14, 801-805.
- Hoza, B., Owens, J. S., Pelham, W. E., Swanson, J. M., Conners, C. K., Hinshaw, S. P., Arnold, L. E., & Kraemer, H. C. (2000). Parent cognitions as predictors of child

- treatment response in Attention Deficit/Hyperactivity Disorder. *Journal of Abnormal Child Psychology*, 28, 569-583.
- Huang, Y., Liu, X., Li, T., Guo, L., Ma, X., Yuan, G., et al. (2002). [Transmission disequilibrium test of DRD4 exon III 48 bp variant number tandem repeat polymorphism and tic disorder]. *Zhonghua Yi Xue Yi Chuan Xue Za Zhi*, 19, 100-103.
- Hughes, C., Dunn, J., & White, A. (1998). Trick or treat? Uneven understanding of mind and emotion and executive dysfunction in “hard-to-manage” preschoolers. *Journal of Child Psychology and Psychiatry*, 39, 981-994.
- Huston, A. C., Donnerstein, E., Fairchild, H., Feshbach, N., Katz, P., Murray, J., et al. (1992). *Big world, small screen: The role of television in American society*. Lincoln, NE: University of Nebraska Press.
- Huston, A.C., & Wright, J. C. (1997). Mass media and children’s development. In: I. Sigel, & K. A. Renninger, (Eds.), *Child psychology in practice* (5th ed.), W. Damon (Ed.), *Handbook of child psychology*, (4, pp. 999-1058). New York: Wiley.
- Huston, A. C., Wright, J. C., Marquis, J., & Green, S. B. (1999). How young children spend their time. Television and other activities. *Developmental Psychology*, 35, 912-925.
- Huston, A. C., Wright, J. C., Rice, M. L., Kerkman, D., & St. Peters, M. (1990). Development of television viewing patterns in early childhood: A longitudinal investigation. *Developmental Psychology*, 26, 409-420.
- Hynd, G. W., Semrud-Clikeman, M., Lorys, A. R., Novey, E. S., & Eliopoulos, D. (1990). Brain morphology in developmental dyslexia and attention deficit disorder/hyperactivity. *Archives of Neurology*, 47, 919-926.

- Jacques, S., & Zelazo, P. D. (2001). A measure of executive function in preschoolers. *Developmental Neuropsychology, 20*, 573-591.
- Johnston, C. (1996). Parent characteristics and parent-child interactions in families of nonproblem children and ADHD children with higher and lower levels of oppositional-defiant behavior. *Journal of Abnormal Child Psychology, 24*, 85-104.
- Johnston, C., & Behrenz, K. (1993). Childrearing discussions in families of nonproblem children and ADHD children with higher and lower levels of aggressive-defiant behaviour. *Canadian Journal of School Psychology, 9*, 53-65.
- Johnston, C., & Mash, E. J. (2001). Families of children with attention-deficit/hyperactivity disorder: Review and recommendations for future research. *Clinical Child and Family Psychology Review, 17*, 513-525.
- Kent, L., Doerry, U., Hardy, E., Parmar, R., Gingell, K., Hawi, Z., et al. (2002). Evidence that variation at the serotonin transporter gene influences susceptibility to attention deficit hyperactivity disorder (ADHD): Analysis and pooled analysis. *Molecular Psychiatry, 7*, 908-912.
- Kirkham, N. Z., Cruess, L., & Diamond, A. (2003). Helping children apply their knowledge to their behaviour on a dimensional-switching task. *Developmental Science, 6*, 449-467.
- Klenberg, L., Korkman, M., & Lahti-Nuutila, P. (2001). Differential development of attention and executive functions in 3- to 12-year-old Finnish children. *Developmental Neuropsychology, 20*, 407-428.
- Kotimaa, A. J., Moilanen, I., Taanila, A., Ebeling, F., Smalley, S. L., McGough, J. J., et al. (2003). Maternal smoking and hyperactivity in 8-year-old children. *Journal of American Academy of Child and Adolescent Psychiatry, 42*, 826-833.

- Krause, K. H., Dresel, S. H., Krause, J., Kung, H. F., & Tatsch, K. (2000). Increased striatal dopamine transporter in adult patients with attention deficit hyperactivity disorder: Effects of methylphenidate as measured by single photon emission computed tomography. *Neuroscience Letters*, *285*, 107-110.
- Krcmar, M., Grela, B., & Lin, K. (2007). Can toddlers learn language from television? An experimental approach. *Media Psychology*, *10*, 41-63.
- Kuhl, P. K., Tsao, F. M., & Liu, H. M. (2003). Foreign language experience in infancy: Effects of short-term exposure and social interaction on phonetic learning. *Proceedings of the National Academy of Sciences of the United States of America*, *100*, 9096-9101.
- Kuhne, M., Schachar, R., & Tannock, R. (1997). Impact of comorbid oppositional or conduct problems on attention-deficit/hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*, 1715-1725.
- Kustanovich, V., Ishii, J., Crawford, L., Yang, M., McGough, J. J., McCracken, J. T., et al. (2004). Transmission disequilibrium testing of dopamine-related candidate gene polymorphisms in ADHD: Confirmation of association of ADHD with DRD4 and DRD5. *Molecular Psychiatry*, *9*, 711-717.
- Lahey, B. B., Applegate, B., McBurnett, K., Biederman, J., et al. (1994). DSM-IV field trials for attention deficit hyperactivity disorder in children and adolescents. *American Journal of Psychiatry*, *151*, 1673-1685.
- Lahey, B. B., Pelham, W. E., Loney, J., Kipp, H., Ehrhardt, A., Lee, S. S., et al. (2004). Three-year predictive validity of DSM-IV attention deficit hyperactivity disorder in children diagnosed at 4-6 years of age. *The American Journal of Psychiatry*, *161*, 2014-2020.

- Lahey, B.B., Pelham, W.E., Stein, M.A., Loney, J., Trapani, C., Nugent, K., et al. (1998). Validity of DSM-IV attention-deficit/hyperactivity disorder for younger children. *Journal of the American Academy of Child and Adolescent Psychiatry*, *37*, 695–702.
- LaHoste, G. J., Swanson, J. M., Wigal, S. B., Glabe, C., Wigal, T., King, N., et al. (1996). Dopamine D4 receptor gene polymorphism is associated with attention deficit hyperactivity disorder. *Molecular Psychiatry*, *1*, 121-124.
- Lengua, L. J. (2006). Growth in temperament and parenting as predictors of adjustment during children's transition to adolescence. *Developmental Psychology*, *42*, 819-832.
- Lerner, J. W., Lowenthal, B., & Lerner, S. R. (1995). *Attention deficit disorders: Assessment and teaching*. Pacific Grove, CA: Brooks/Cole.
- Levy, F., Hay, D. A., McStephen, M., Wood, C., & Waldman, I. (1997). Attention deficit hyperactivity disorder: A category or continuum? Genetic analysis of a large-scale twin study. *Journal of the American Academy of Child and Adolescent Psychiatry*, *36*, 737, 744.
- Lindahl, K. M. (1998). Family process variables and children's disruptive behavior problems. *Journal of Family Psychology*, *12*, 420-436.
- Losoya, N., Eisenberg, R. A., & Fabes, S. (1998). Developmental issues in the study of coping. *International Journal of Behavioral Development*, *22*, 287-313.
- Lou, H. C., Rosa, P., Pryds, O., Karrebaek, H., Lundling, J., Cumming, P., et al. (2004). ADHD: increased dopamine receptor availability linked to attention deficit and low neonatal cerebral blood flow. *Developmental Medicine and Child Neurology*, *46*, 179-183.

- Lowe, N., Kirley, A., Hawi, Z., Sham, P., Wickham, H., Kratochvil, C. J., et al., (2004). Joint analysis of the DRD5 marker concludes association with attention-deficit/hyperactivity disorder confined to the predominantly inattentive and combined subtypes. *The American Journal of Human Genetics*, *74*, 348-356.
- Maccoby, E. E., Snow, M. E., & Jacklin, C. N. (1984). Children's dispositions and mother-child interaction at 12 and 18 months: A short-term longitudinal study. *Developmental Psychology*, *20*, 459-472.
- Maher, B. S., Marazita, M. L., Ferrell, R. E., & Vanyukov, M. M. (2002). Dopamine system genes and attention deficit hyperactivity disorder: A meta-analysis. *Psychiatric Genetics*, *12*, 207-215.
- Mannuzza, S., & Klein, R. G. (2000). Long-term prognosis in attention-deficit/hyperactivity disorder. *Child and Adolescent Psychiatric Clinics of North America*, *9*, 711-726.
- Manor, I., Eisenberg, J., Tyano, S., Sever, Y., Cohen, H., Ebstein, R. P., et al. (2001). Family-based association study of the serotonin transporter promoter region polymorphism (5-HTTLRP) in attention deficit hyperactivity disorder. *American Journal of Medical Genetics*, *105*, 91-95.
- Mariani, M. A., & Barkley, R. A. (1997). Neuropsychological and academic functioning in preschool boys with attention deficit hyperactivity disorder. *Developmental Neuropsychology*, *13*, 111-129.
- Marks, D. J., Berwid, O. G., Santra, A., Kera, E. C., Cyrulnik, S. E., & Halperin, J. M. (2005). Neuropsychological correlates of ADHD symptoms in preschoolers. *Neuropsychology*, *19*, 446-455.

- Marks, D. J., Cyrulnik, S. E., Kera, E. C., Berwid, O. G., Santra, A., & Halperin, J. M. (2006). Objective and subjective assessments of parenting in hyperactive preschoolers. *Infant and Child Development, 15*, 439-442.
- Mash, E. J., & Johnston, C. (1990). Determinants of parenting stress: Illustrations from families of hyperactive children and families of physically abused children. *Journal of Clinical Child Psychology, 19*, 313-328.
- McClellan, J. M., & Speltz, M. L. (2003). Psychiatric diagnosis in preschool children. *Journal of the American Academy of Child and Adolescent Psychiatry, 42*, 127-128.
- McFarlane, A., & Tedds, L. M. (2008). Work, rest, and play: Exploring trends in time allocation in Canada and the United States. *Working Paper Series*. Available at SSRN: <http://ssrn.com/abstract=1001361>.
- McGee, R., Partridge, F., Williams, S., & Silva, P. A. (1991). A twelve-year follow-up of preschool hyperactive children. *Journal of the American Academy of Child and Adolescent Psychiatry, 30*, 224-232.
- McKenzie, T. L., Sallis, J. F., Nader, P. R., & Broyles, S. L. (1992). Anglo- and Mexican-American preschoolers at home and at recess: Activity patterns and environmental influences. *Journal of Developmental and Behavioral Pediatrics, 13*, 173-180.
- Mill, J., Curran, S., Richards, S., Taylor, E., & Asherson, P. (2004). Polymorphisms in the dopamine D5 receptor (DRD5) gene and ADHD. *American Journal of Medical Genetics, 126B*, 38-42.
- Miller, C. J., Knezevic, B., & Halperin, J. M. (2009, June). Television content and externalizing behaviours in young children. Poster session presented at the biennial meeting of the International Society for Research in Child and Adolescent Psychopathology, Seattle, WA.

- Miller, C. J., Marks, D., Miller, S. R., Berwid, O., Kera, E. C., Santra, A., et al. (2007). Brief report: Television viewing and risk for attention problems in preschool children. *Journal of Pediatric Psychology, 32*, 448-452.
- Minde, K., Tidmarsh, L., & Hughes, S. (2001). Nurses' and physicians' assessment of mother-infant mental health at the first postnatal visits. *Journal of the American Academy of Child and Adolescent Psychiatry, 40*, 803-810.
- Minuchin, P. (1985). Families and individual development: Provocations from the field of family therapy. *Child Development, 56*, 289-302.
- Molina, B. S. G., Pelham, W. E., & Lang, A. R. (1997). Alcohol expectancies and drinking characteristics in parents of children with attention deficit hyperactivity disorder. *Alcoholism: Clinical and Experimental Research, 21*, 557-566.
- Mrug, S., Hoza, B., & Gerdes, A. C. (2001). Children with attention-deficit/hyperactivity disorder: Peer relationships and peer-oriented interventions. *New Directions for Child and Adolescent Development, 91*, 51-78.
- Murray, D. W., Kollins, S. H., Hardy, K. K., Abikoff, H. W., Swanson, J. M., et al. (2007). Parent versus teacher ratings of attention-deficit/hyperactivity disorder symptoms in the preschoolers with attention-deficit/hyperactivity treatment study (PATS). *Journal of Child and Adolescent Psychopharmacology, 17*, 605-619.
- Nakao, K., & Treas, J. (1994). Updating occupational prestige and socioeconomic scores: How the new measures measure up. *Sociological Methodology, 24*, 1-72.
- Newcomb, A. F., Bukowski, W. M., Patte, L. (1993). Children's peer relations: A meta-analytic review of popular, rejected, neglected, controversial, and average socio-metric status. *Psychological Bulletin, 113*, 99-128.

- Nomura, Y., Rajendran, K., Brooks-Gunn, J., & Newcorn, J. H. (2008). Roles of perinatal problems on adolescent antisocial behaviours among children born after 33 completed weeks: a prospective investigation. *Child Psychology and Psychiatry*, *49*(10), 1108-1117.
- Ostberg, M., & Hagekull, B. (2000). A structural modelling approach to the understanding of parenting stress. *Journal of Clinical Child and Adolescent Psychology*, *29*, 615-625.
- Paik, H., & Comstock, G. (1994). The effects of television violence on antisocial behavior: A meta-analysis. *Community Resolution*, *21*, 516-546.
- Paley, B., Conger, R. D., & Harold, G. T. (2000). Parents' affect, adolescent cognitive representations, and adolescent social development. *Journal of Marriage and the Family*, *62*, 761-776.
- Payton, A., Holmes, J., Barrett, J. H., Hever, T., Fitzpatrick, H., Trumper, A. L., et al. (2001). *American Journal of Medical Genetics (Neuropsychiatric Genetics)*, *105*, 464-470.
- Pelham, W. E., & Lang, A. R. (1999). Can your children drive you to drink? *Alcohol Research and Health*, *23*, 292-298.
- Pennington, B. F., & Ozonoff, S. (1996). Executive functions and developmental psychopathology. *The Journal of Child Psychology and Psychiatry*, *37*, 51-87.
- Peterson, B. S., Leckman, J. F., Tucker, D., Scahill, L., Staib, L., Zhang, H., et al. (2000). Preliminary findings of antistreptococcal antibody titers and basal ganglia volumes in tic, obsessive-compulsive, and attention deficit/hyperactivity disorders. *Archives of General Psychiatry*, *57*, 364-372.

- Picot, G., & Myles, J. (1995). *Social transfers, changing family structure, and low income among children* (Research Paper Series, Analytical Studies Branch 82). Ottawa, ON: Statistics Canada.
- Pierce, E. W., Ewing, L. J., & Campbell, S. B. (1999). Diagnostic status and symptomatic behavior of hard-to-manage preschool children in middle childhood and early adolescence. *Journal of Clinical Child Psychology, 28*, 44-57.
- Psychogiou, L., Daley, D.M., Thompson, M.J., & Sonuga-Barke, E.J.S. (2008). Do maternal attention-deficit/hyperactivity disorder symptoms exacerbate or ameliorate the negative effect of child attention-deficit/hyperactivity disorder symptoms on parenting? *Development and Psychopathology, 20*, 121-137.
- Purper-Ouakil, D., Wohl, M., Mouren, M. C., Verpillat, P., Ades, J., & Gorwood, P. (2005). Meta-analysis of family based association studies between the dopamine transporter gene and attention deficit hyperactivity disorder. *Psychiatric Genetics, 15*, 53-59.
- Qian, Q., Wang, Y., Li, J., Yang, L., Wang, B., & Zhou, R. (2003). Association studies of dopamine D4 receptor genes and dopamine transporter gene polymorphisms in Han Chinese patients with attention deficit hyperactivity disorder. *Beijing Da Xue Xue Bao, 35*, 412-418.
- Rice, M. L., Huston, A. C., Truglio, R., & Wright, J. (1990). Words from "Sesame Street": Learning vocabulary while viewing. *Developmental Psychology, 26*, 421-428.
- Richman, N., Stevenson, J., & Graham, P. J. (1982). *Preschool to school: a behavioral study*. London: Academic Press.

- Rideout, V. J., & Hamel, V. (2006). *The media family: Electronic media in the lives of infants, toddlers, preschoolers, and their parents*. Menlo Park, CA: The Henry J. Kaiser Family Foundation: Children's Digital Media Centres.
- Rideout, V. J., Foehr, U. G., Roberts, D. F., & Brodie, M. (1999). *Kids and media at the new millennium. Executive summary*. Menlo Park, CA: Kaiser Family Foundation.
- Rideout, V. J., Vandewater, E. A., & Wartella, E. A. (2003). *Zero to six: Electronic media in the lives of infants, toddlers, and preschoolers*. Menlo Park, CA: Kaiser Family Foundation.
- Roberts, M. W. (2001). Clinic observations of structured parent-child interaction designed to evaluate externalizing disorders. *Psychological Assessment, 13*, 46-58.
- Rogers, S. J., & White, L. K. (1998). Satisfaction with parenting: The role of maternal happiness, family structure, and parents' gender. *Journal of Marriage and the Family, 60*, 293-308.
- Rydell, A. M., Hagekull, B., & Bohlin, G. (1997). Measurements of two social competence aspects in middle childhood. *Developmental Psychology, 33*, 824-833.
- Schachar, R. J., Wachsmuth, R. (1991). Family dysfunction and psychosocial adversity: Comparison of attention deficit disorder, conduct disorder, normal and clinical controls. *Canadian Journal of Behavioural Science, 23*, 332-348.
- Schermerhorn, A. C., Cummings, E. M., DeCarlo, C. A., & Davies, P. T. (2007). Children's influence in the marital relationship. *Journal of Family Psychology, 21*, 259-269.
- Schnoll, R., Burshteyn, D., & Cea-Aravena, J. (2003). Nutrition in the treatment of attention-deficit hyperactivity disorder: A neglected but important aspect. *Applied Psychophysiology and Biofeedback, 28*, 63-75.

- Schulz, K. P., Tang, C. Y., Fan, J., Marks, D. J., Cheung, A. M., Newcorn, J. H., et al. M. (2005). *Neuropsychology*, *19*(3), 390-402.
- Semrud-Clikeman, M., Filipek, P. A., Biederman, J., Steingard, R., Kennedy, D., Renshaw, P., et al. (1994). Attention-deficit hyperactivity disorder: Magnetic resonance imaging morphometric analysis of the corpus callosum. *Journal of American Academy of Child and Adolescent Psychiatry*, *33*, 875-881.
- Semrud-Clikeman, M., Steingard, R. J., Filipek, P., Biederman, J., Bekken, K., & Renshaw, P. F. (2000). Using MRI to examine brain-behavior relationships in males with attention deficit disorder with hyperactivity. *Journal of the American Academy of Child and Adolescent Psychiatry*, *39*, 477-484.
- Senn, T. E., Espy, K. A., & Kaufman, P. M. (2004). Using path analysis to understand executive function organization. *Developmental Neuropsychology*, *26*, 445-464.
- 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*, 3-28.
- Shaw, D. S., Vondra, J. I., Hommerding, K. D., Keenan, K., & Dunn, M. (1994). Chronic family adversity and early child behaviour problems: A longitudinal study of low income families. *Journal of Child Psychology and Psychiatry*, *35*, 1109-1122.
- Shaw, D. S., Winslow, E. B., Owens, E. B., Vondra, J. I., Cohn, J. F., & Bell, R. Q. (1998). The development of early externalizing problems among children from low-income families: A transformational perspective. *Journal of Abnormal Child Psychology*, *26*, 95-107.
- Silberg, J., Rutter, M., Meyer, J., Maes, H., Hewitt, J., Simonoff, E., et al. (1996). Genetic and environmental influences on the covariation between hyperactivity and conduct

- disturbance in juvenile twins. *The Journal of Child Psychology and Psychiatry*, 37, 803-816.
- Snow, D. (1994). Phrase-final syllable lengthening and intonation in early child speech. *Journal of Speech & Hearing Research*, 37, 831-840.
- Solanto, M. V. (1998). Neuropsychopharmacological mechanisms of stimulant drug action in attention-deficit hyperactivity disorder: A review and integration. *Behavioral Brain Research*, 94, 127-152.
- Sonuga-Barke, E. J. S., Auerbach, J., Campbell, S. B., Daley, D., & Thompson, M. (2005). Varieties of preschool hyperactivity: multiple pathways from risk to disorder. *Developmental Science*, 8, 141-150.
- Sood, B., Delaney-Black, V., Covington, C., Nordstrom-Klee, B., Ager, J., Templin, T., et al. (2001). Prenatal alcohol exposure and childhood behaviour at age 6 and 7: I dose-response effect. *Pediatrics*, 108, e34.
- Sowell, E. R., Thompson, P. M., Welcome, S. E., Henkenius, A. L., Toga, A. W., & Peterson, B. S. (2003). Cortical abnormalities in children and adolescents with attention-deficit hyperactivity disorder. *The Lancet*, 362, 1699-1707.
- Spencer, T., Biederman, J., Wilens, T., Harding, M., O'Donnell, D., & Griffin, S. (1996). Pharmacotherapy of attention-deficit hyperactivity disorder across the life cycle. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 409-432.
- Spivak, B., Vered, Y., Yoran-Hegesh, R., Averbuch, E., Mester, R., Graf, E., et al. (1999). Circulatory levels of catecholamines, serotonin and lipids in attention deficit hyperactivity disorder. *Acta Psychiatrica Scandinavica*, 99, 300-304.
- Statistics Canada. (2006). *Government transfers and income tax*. (Catalogue no. 75-202-X). Ottawa, ON: Statistics Canada.

- Statistics Canada. (2007). *Windsor, Ontario (table). 2006 Community Profiles*. 2006 Census.
- Swanson, J., Posner, M., Fusella, J., Wasdell, M., Sommer, T., & Fan, J. (2001). Genes and attention deficit hyperactivity disorder. *Current Psychiatry Reports*, *3*, 92-100.
- Thapar, A., Fowler, T., Rice, F., Scourfield, J., Van Den Bree, M., Thomas, M., et al. (2003). Maternal smoking during pregnancy and attention deficit hyperactivity disorder symptoms in offspring. *American Journal of Psychiatry*, *160*, 1985-1989.
- Thapar, A., Holmes, J., Poulton, K., & Harrington, R. (1999). Genetic basis of attention deficit and hyperactivity. *The British Journal of Psychiatry*, *174*, 105-111.
- Todd, R. D., Huang, H., Smalley, S. L., Nelson, S. F., Willcut, E. G., Pennington, B. F., et al. (2005). Collaborative analysis of DRD4 and DAT genotypes in population-defined ADHD subtypes. *Journal of Child Psychology and Psychiatry*, *46*(10), 1067-1073.
- Torrey, B. B., & Jacobs, E. (1993). More than loose change: Household health spending in the United States and Canada. *Health Affairs*, *12*, 126-131.
- United States. Census Bureau. (2007, August). *Income, earnings, and poverty data from the 2006 American community survey*; August 2007 report. Retrieved 5 August 2008 from the U.S. Census Bureau Web site:
<http://www.census.gov/prod/2007pubs/acs-08.pdf>
- Vandewater, E. A., Cummings, H. M., & Lee, E. H. (2005). *Television content coding manual: Designed for use with time diary information from the PSID child development supplement (CDS)*. The University of Texas at Austin.
- Vandewater, E. A., Lee, J. H., & Shim, M. S. (2005). Family conflict and violent electronic media use in school-aged children. *Media Psychology*, *7*, 73-86.

- Von Stauffenberg, C., & Campbell, S. B. (2007). Predicting the early developmental course of symptoms of attention deficit hyperactivity disorder. *Journal of Applied Developmental Psychology, 28*, 536-552.
- Waldman, I. D., & Rhee, S. H. (2002). Behavioral and molecular genetic studies. In S. Sandberg (Ed.), *Hyperactivity and attention disorders in childhood* (290-335) (2nd ed.). New York: Cambridge University Press.
- Wechsler. (2002). *Wechsler Preschool and Primary Scale of Intelligence – Third Edition (WPPSI-III)*.
- Welsch, M. C., Pennington, B. F., & Grossier, D. B. (1991). A normative development study of executive function: A window on prefrontal function in children. *Developmental Neuropsychology, 7*, 131-149.
- Wood, D., Halfon, N., Scarlata, D., Newacheck, P., & Nessim, S. (1993). Impact of family relocation on children's growth, development, school function, and behavior. *The Journal of the American Medical Association, 270*, 1334-1338.
- Wood, W., Wong, F. Y., & Chachere, J. G. (1991). Effects of media violence on viewer's aggression in unconstrained social interaction. *Psychological Bulletin, 109*, 371-383.
- Wolfson, M. C. (1997). Divergent inequalities: Theory and empirical results. *Review of Income and Wealth, 401-421*.
- Wolfson, M. C., & Murphy, B. B. (1998). New views on inequality trends in Canada and the United States. *Monthly Labor Review, 121*, 3-23.
- Wright, J. C., Huston, A. C., Vandewater, E. A., Bickham, D. S., Scantlin, R. M., Kotler, J. A., Caplovitz, A. G., Lee, J. H., Hofferth, S., & Finkelstein, J. (2001). American

- children's use of electronic media in 1997: A national survey. *Applied Developmental Psychology, 22*, 31-47.
- Wymbs, B. T., Pelham W. E., M. Gnagy, E. M., Molina, B. S. G., Wilson, T. K., & Greenhouse, J. B. (2008). Rate and predictors of divorce among parents of youths with ADHD. *Journal of Consulting and Clinical Psychology, 76*, 735-744.
- Xu, C., Schachar, R., Tannock, R., Roberts, W., Malone, M., Kennedy, J. L., et al. (2001). Linkage study of the alpha 2A adrenergic receptor in attention-deficit hyperactivity disorder families. *American Journal of Medical Genetics, 105*, 159-162.
- Zimmerman, F. J., & Christakis, D. A. (2007). Association between content types of early media exposure and subsequent attention problems. *Pediatrics, 120*, 986-992.
- Zimmerman, F. J., Glew, G., Christakis, D. A., & Katon, W. (2005). Early cognitive stimulation, television watching, and subsequent bullying among grade-school children. *Archives of Pediatrics and Adolescent Medicine, 159*, 384-388.
- Zito, J. M., Safer, D. J., dosReis, S., Gardner, J. F., Boles, M., & Lynch, F. (2000). Trends in prescribing of psychotropic medications to preschoolers. *Journal of the American Medical Association, 283*, 1025-1030.
- Zuckerman, D. M., Singer, D. G., & Singer, J. L. (1980). Children's television viewing, racial and sex-role attitudes. *Journal of Applied Social Psychology, 10*, 281-294.

Table 1

Means and Standard Deviations for Demographics

	Control		At-Risk		<i>t</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Age at entry	3.94	0.54	3.89	0.54	-1.428	.196
Mean SES	48.94	19.57	53.18	12.34	.728	.490
Mean IQ ^a	12.32	2.38	13.38	3.34	.110	.916
% Male	40		50			
Race						
% Caucasian	76.0		87.5			
% Other/mixed	24.0		12.5			

^a Estimated Mean IQ using Information subtest of the Wechsler Preschool and Primary Scales of Intelligence – Third Edition (WPPSI; Wechsler, 2002). Average score is 10 (*SD* = 3).

Table 2

Means and Standard Deviations for Measures

	Total		Control		At-Risk	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Average daily TV ^a	2.41	1.72	2.31	1.75	2.73	1.73
TV content ^{a b}	1.51	.66	1.56	.68	1.33	.62

Note. Average daily TV corresponds to the daily average television viewed and TV content corresponds to the macrocategory for content in the child's preferred television program.

^a $N = 33$, At risk: $n = 8$, Control: $n = 25$.

^b Average was calculated by adding the television content scores for the child's preferred television programs and dividing the total by three. Education only was coded as one, entertainment without violence was coded as two, and entertainment with any type of violence was coded as three.

VITA AUCTORIS

Bojana Knezevic was born in Belgrade, Serbia in 1982 and moved to Toronto, Canada at the age of 13 years. She graduated from Etobicoke Collegiate Institute in 2001 and went to York University in Toronto where she obtained an Honours Bachelor of Science degree in Psychology Major/Biology Minor in 2006. She is currently in the Ph.D. programme in clinical neuropsychology at the University of Windsor.