SOURCES OF SELF-EFFICACY, SELF-EFFICACY FOR SELF-REGULATED LEARNING, AND STUDENT ENGAGEMENT IN ADOLESCENTS WITH ADHD

by

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Abstract

In the study of motivation and achievement, self-efficacy for self-regulated learning (SESRL) beliefs have been identified as a driving force behind student engagement in learning. Self-efficacy perceptions are thought to be shaped by four key sources of information: mastery experiences, vicarious learning, verbal encouragement, and emotional states. Although adolescents with ADHD exhibit deficits in motivation and self-regulation, few researchers have examined SESRL beliefs in this population, including the sources of self-efficacy and their potential influence on student engagement. Therefore, the objectives of this dissertation were to: (1) examine group (ADHD versus comparison) and gender differences in the sources of self-efficacy, SESRL, and student engagement, and (2) investigate the relations between these variables and symptoms of inattention. Adolescents completed measures of the sources of self-efficacy, SESRL, and engagement, while parents rated their children’s inattention symptoms. To address objective one, participants were 98 adolescents (age 14 to 16), with 47 (30 males, 17 females) classified as having ADHD and 51 (19 males, 32 females) forming a typically functioning comparison group. To address objective two, the ADHD and comparison groups were combined to form a larger sample of 105 adolescents (53 males, 52 females). Results revealed that, relative to their non-ADHD peers, adolescents with ADHD rated themselves as having fewer mastery experiences, less positive
encouragement from others, lower SESRL beliefs, and lower levels of engagement. Gender differences also emerged in the sources of self-efficacy, with male adolescents rating themselves lower than females in mastery experiences, vicarious learning, and verbal encouragement. Path analysis in the full sample showed that the sources of self-efficacy and SESRL mediated the relationship between inattention and student engagement. These results contribute to our understanding of motivation in adolescents with ADHD and shed light on how they perceive themselves and their school experiences. Clinical and educational implications involve designing interventions that not only focus on building knowledge and skills, but also on supporting adolescents in developing the confidence to succeed.
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CHAPTER 1

INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental disorder characterized by persistent difficulties with sustaining attention, inhibiting behaviour, and regulating activity levels (U.S. Department of Education, 2003). These core symptoms create a host of challenges for individuals with ADHD, including functional impairment across home, school, and social settings (American Psychiatric Association, 2013). ADHD is typically diagnosed in childhood, with approximately 5 to 7 percent of children affected (Polanczyk, Willcutt, Salum, Kieling, & Rohde, 2014; Willcutt, 2012). Although prevalence rates decline with age (Biederman, Mick, & Faraone, 2000; Biederman, Petty, Evans, Smally, & Faraone, 2010), many adolescents who were diagnosed as children will continue to experience subthreshold levels of symptoms as well as clinically significant impairment across multiple domains of functioning (Hinshaw et al., 2006; Lahey et al., 2004; Lee, Lahey, Owens, & Hinshaw, 2008; Mannuzza et al., 1998; Sibley et al., 2012). Relative to children, however, there is a small research base in adolescents with ADHD, which limits our understanding of ADHD across the life-span (Faraone, 2013). Of particular concern in adolescents with ADHD is poor educational outcomes, as academic underachievement has been associated with high school dropout and significant occupational and socioeconomic disadvantage (Barbaresi, Katusic, Colligan, Weaver, & Jacobsen, 2007; Barkley, Fischer, Edelbrock, & Smallish, 1990; Biederman et al., 2006; Faraone et al., 2000; Kent et al., 2011; Murphy &
Barkley, 1996). Therefore, it is a priority that researchers continue to identify those factors that promote academic success in individuals with ADHD, particularly during adolescence, a period of development that is marked by a number of transitions and increasing academic and social demands (Holmbeck, Friedman, Abad, & Jandasek, 2006; Litner, 2003).

Low academic motivation is particularly salient during adolescence and is a major factor that negatively influences the academic functioning of adolescents (Schunk & Mullen, 2012). Motivation is often defined as the process whereby goal-directed activities are energized, directed, and sustained (Schunk, Pintrich, & Meece, 2008). It is a complex and multi-faceted construct that comprises cognitive (e.g., self-perceptions, beliefs), affective (e.g., interest), and behavioural (e.g., engagement, effort and persistence) components (Schunk et al., 2008; Schunk & Mullen, 2012). In typically developing children and adolescents, student engagement is one of the most valuable motivational variables to examine when exploring student behaviours that are linked to improved educational functioning (Archambault, Janosz, Morizot, & Pagani, 2009; Bandura, Barbaranelli, Caprara, & Pastorelli, 1996; Greenwood, 1996; Whitlock, 2006). Student engagement is often viewed as the manifestation of motivation, or how one’s cognitions, behaviors, and emotional reactions are energized, directed, and sustained during learning and other academic activities (Skinner, Kindermann, Connell, & Wellborn, 2009). Students who are more engaged at school experience more frequent learning opportunities, achieve higher grades, and are less likely to drop out (e.g., Archambault et al., 2009; Bandura et al., 1996; Finn & Zimmer, 2012; Marks, 2000; Wang & Holcombe, 2010; Whitlock, 2006). Although there is ample evidence to support
a motivational dysfunction in adolescents with ADHD (Barkley, 1997; Carlson, Booth, Shin, & Canu, 2002; Hoza, Waschbusch, Owens, Pelham, & Kipp, 2001), very few researchers have directly investigated their engagement levels, despite the increased risk for underachievement and dropout in this population (e.g., Loe & Feldman, 2007; Wehmeier, Schacht, & Barkley, 2010). Given that educators can foster engagement behaviours in students to enhance educational outcomes (e.g., Christenson, 2009; Christenson et al., 2008; Reschly & Christenson, 2006), there is considerable value to understanding student engagement in adolescents with ADHD.

Although there are different theoretical approaches used to explain student motivation and engagement, the present study draws on Bandura’s (1986, 1997, 2001) social cognitive theory of psychological functioning. This model emphasizes that individuals are active agents who are engaged in shaping their own development and outcomes. Bandura proposed that self-efficacy beliefs—or one’s perceived capabilities for learning or performing actions at designated levels—are a key cognitive variable that influence motivation, self-regulation and, in particular, student engagement (Bandura, 1986, 1997; Schunk & Mullen, 2012). Self-efficacy for self-regulated learning (SESRL) is of particular interest in the current study and refers to the beliefs that students hold about their ability to use self-regulated learning strategies to cope with difficult learning conditions (Bandura, 2006). There is a substantial amount of literature demonstrating that SESRL beliefs affect the degree to which students are engaged in their learning; in turn, this engagement promotes their competence as learners and their academic achievement (Bandura, 1997; Caraway, Tucker, Reinke, & Hall, 2003; Linnenbrink & Pintrich, 2003; Pajares, 1996; Schunk & Pajares, 2009; Usher & Pajares, 2006; Walker, Greene, &
Mansell, 2006). Unfortunately, students who have low levels of confidence in their ability to self-regulate their learning are less likely to rely on adaptive strategies when faced with challenging tasks and are more likely to give up in the face of difficulty (Pajares, 1996). Despite the solid foundation of self-efficacy research in typically developing children and adolescents, fewer scholars have assessed its relevance for adolescents with ADHD. This is of critical importance, as understanding the self-efficacy beliefs of adolescents with ADHD and their role in student engagement may serve to inform existing academic, pharmacological, and behavioural interventions. Furthermore, adolescents with ADHD may be particularly at risk for low SESRL given that self-regulation weaknesses characterize many children and adolescents with the disorder (e.g., Johnson & Reid, 2011; Toplak, Bucciarelli, Jain, & Tannock, 2009). Prominent theoretical models of ADHD suggest that individuals with ADHD have difficulties using higher-order cognitive skills, referred to as executive functions (EFs; e.g., planning, goal-setting, self-monitoring, task initiation, self-motivation, working memory, emotion regulation), to self-regulate and attain their goals (Barkley, 2012). While deficits in EFs and self-regulation in adolescents with ADHD are well-documented (e.g., Barkley, Murphy, & Bush, 2001; Nigg, Hinshaw, Carte, & Treuting, 1998; Toplak et al., 2009; Valera, Faraone, Murray, & Seidman, 2007; Willcutt et al., 2010; Willcutt et al., 2005), little is known regarding their beliefs about their ability to self-regulate their learning. This study’s findings will provide a unique contribution to this literature and will expand our knowledge of the academic functioning of these adolescents.

Although it has been widely established that self-efficacy beliefs can powerfully influence academic outcomes (see Pajares, 1996 for a review), less is known about how
these beliefs develop, particularly in adolescents with ADHD. Embedded in his social cognitive theory, Bandura (1997, 2000) suggested that self-efficacy beliefs are acquired through four major sources: previous experiences of success (mastery experiences); exposure to and identification with efficacious models (vicarious experiences); verbal encouragement and support from others (verbal/social persuasion); and emotional reactions in the context of task performance (physiological responses/arousal). Consistent with this theory, research on typically developing adolescents indicates that these four sources account for a significant proportion of variance in academic self-efficacy and SESRL (e.g., Anderson & Betz, 2001; Usher & Pajares, 2006, 2008). There is evidence to suggest that adolescents with disabilities, including those with ADHD, may have less access to these sources and that this reduced access may influence the development of self-efficacy in these individuals (Hampton, 1998; Hampton & Mason, 2003). However, there is no known research examining the sources of self-efficacy in adolescents with ADHD. Understanding how the sources of self-efficacy relate to enhanced self-efficacy beliefs is of particular interest to those working with adolescents with ADHD in secondary schools, as this represents a time when self-efficacy beliefs are of critical importance to academic success (Caprara et al., 2008; Zimmerman, 2000).

The overall objective of this dissertation is to expand the literature on motivation in adolescents with ADHD by examining important social cognitive and motivational variables including sources of self-efficacy, SESRL, and student engagement, as well as the relations among these variables, in a sample of adolescents with and without ADHD.
CHAPTER 2

LITERATURE REVIEW

The present chapter will provide an overview of relevant constructs that are the focus of this dissertation, including definitions of key variables and a review of existing research. This chapter will also briefly describe the history of ADHD and current trends in the ADHD literature, as well as relevant research in the areas of self-efficacy, the sources of self-efficacy, and student engagement. It will conclude with a description of the primary objectives and rationale for the present research. I will also explain how this research intends to contribute to our understanding of ADHD. The methods for this research study are outlined in Chapter 3, and Chapter 4 will describe the study results. This dissertation will end with Chapter 6, in which I provide a discussion of the results, relevant clinical and practical implications, the study limitations, and directions for future research.

ADHD

History, Definition, Prevalence, and Etiology

The conceptualization of ADHD has evolved considerably throughout its history. Symptoms consistent with ADHD were first described in the medical literature in 1775 by German physician, Melchior Adam Weikard (Barkley & Peters, 2012). By the early 20th century, observations of ADHD-like behaviours were increasingly documented; however, it was not until 1968 that an early definition of the disorder, termed “Hyperkinetic Reaction of Childhood,” was officially recorded in the Diagnostic and Statistical Manual of Mental Disorders (DSM-II; Barkley, 2006). By the 1970s, the growth of systematic research led to a reconceptualization of the condition, including a
recognition that many children displayed symptoms of inattention without significant levels of hyperactivity (Barkley, 2006). With the third edition of the DSM published in 1980 came the first reliable operational diagnostic criteria for “Attention Deficit Disorder (ADD), with or without hyperactivity.” The criteria included symptom lists for inattention, hyperactivity, and impulsivity, cutoff scores for symptoms, guidelines for age of onset and duration, and exclusionary criteria (Barkley, 2006; Lange, Reichi, Lange, Tucha, & Tucha, 2010). The disorder was renamed to its current label “Attention Deficit-Hyperactivity Disorder (ADHD)” in a revised version of the DSM-III. With the publication of the DSM-IV in 1994, factor analytic research supported the existence of three subtypes (a predominately inattentive type; a predominately hyperactive-impulsive type; and a combined type with symptoms of both dimensions) along with increasing recognition of the disorder beyond childhood (American Psychiatric Association 1994; Barkley, 2006; Lahey et al. 1994; Lange et al., 2010).

The most recent update to ADHD nosology came in 2013 with the release of the DSM-5 (American Psychiatric Association, 2013; Epstein & Loren, 2013). This update included several modifications to previous definitions of the disorder including a greater consideration regarding the manifestation of symptoms of ADHD in adolescents and adults as well as the elimination of subtypes with the inclusion of specifiers depicting current presentation (Epstein & Loren, 2013). This latter shift from ‘subtypes’ to ‘presentations’ reflected research demonstrating that the DSM-IV subtypes do not accurately represent discrete subgroups with adequate long-term stability, but that symptoms are fluid states that change across an individual’s lifespan (Lemiere et al., 2010; Willcutt et al., 2012). Another notable shift in the DSM-5 from previous editions is
the conceptualization of ADHD as a ‘neurodevelopmental disorder’ rather than a ‘disruptive behaviour disorder.’ This shift not only captures the increasing evidence for brain abnormalities in ADHD, but it also has important implications for how ADHD is understood and treated by parents, clinicians, and educators (Epstein & Loren, 2013).

According to the definition of ADHD in the DSM-5, Criterion A requires individuals to demonstrate six or more symptoms of inattention and/or hyperactivity/impulsivity for children up to age 16, or five or more for individuals 17 and older. Criterion B indicates that symptoms must be present before the age of 12, and Criterion C states that these symptoms must occur in two or more settings (e.g., home, school, work, social settings). According to Criterion D, there must be clear evidence that the symptoms interfere with, or reduce the quality of an individual’s functioning. Lastly, Criterion E states that the symptoms must not be better explained by another psychiatric disorder (e.g., Schizophrenia, Mood Disorder, Anxiety Disorder). Based on the combination of symptoms, three ‘presentations’ of ADHD can occur: a predominately inattentive presentation, a predominately hyperactive-impulsive presentation, and a combined presentation. Presentations are identified based on an individual’s current symptomatology and can change over time (American Psychological Association, 2013; Epstein & Loren, 2013). Furthermore, modifiers (e.g., mild, moderate, and severe) can be used to indicate symptom severity (Epstein & Loren, 2013).

Like other psychological and mental health conditions, there is no single, objective test used to diagnose ADHD. In children and adolescents, current practice guidelines indicate that ADHD parent and teacher reports of diagnostic criteria should be used to evaluate ADHD symptoms and functional impairment (American Academy of
Information can be collected via diagnostic interviews or validated ratings scales, although most clinicians combine informant reports to examine symptom patterns across settings (De Los Reyes & Kazdin, 2005; Offord et al., 1996; Pelham, Fabiano, & Massetti, 2005; Piacentini, Cohen, & Cohen, 1992; Rubio-Stipec, Fitzmaurice, Murphy, & Walker, 2003; Seixas, Weiss, & Muller, 2012; Wright, Waschbusch, & Frankland, 2007). Clinicians gather information regarding symptom presentation, age of onset, and functional impairment, and determine whether symptoms are more persistent, severe, and impairing than what is expected based on the child’s developmental level (American Psychiatric Association, 2015; Faraone et al., 2015; Seixas et al., 2012).

ADHD is one of the most common neuropsychological disorders affecting children (Faraone et al., 2015). In 2012, Willcutt completed a meta-analytic review of 86 studies and found that 5.9% to 7.1% of children and adolescents worldwide met DSM-IV diagnostic criteria for ADHD. Although epidemiological studies exclusively in Canadian samples are less common, a study by Brault and Lacourse (2012) revealed that, between 2006 and 2007, 4.1% of Canadian school-age children had an ADHD diagnosis. Despite growing concerns among professionals and the public that ADHD is on the rise, when standardized diagnostic procedures are followed, there is no empirical evidence to support a genuine increase in the number of ADHD diagnoses over the last three decades (Polanczyk et al., 2014; Singh, 2008; Timimi, 2004).

Prevalence rates for ADHD have been examined in relation to other sociodemographic variables, including country of origin, gender, and socioeconomic status. Although estimates vary widely across studies, researchers have found that, after
controlling for variability in how ADHD is defined, there are no significant differences in the number of ADHD case across countries in Europe, Africa, Australia, Asia, and the Americas (Polanczyk et al., 2014; Willcutt, 2012). With respect to gender differences, ADHD more commonly affects males in childhood and adolescence, with a male-to-female ratio of 4:1 in clinical samples and 2.4:1 in community samples (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). In adulthood, these differences nearly disappear (e.g., Matte et al., 2015), leading some researchers to question the accuracy of gender ratios in childhood. Some have suggested a possible referral bias in males due to their increased tendency to show disruptive behaviours (e.g., Gershon & Gershon, 2002; Solden, 1995), while others have speculated that the DSM criteria do not adequately capture symptoms in females (e.g., Nadeau & Quinn, 2002; Staller & Faraone, 2006); however, longitudinal research is still needed to clarify this debate (Nussbaum, 2012).

Lastly, some studies have connected low household income to increased rates of ADHD (e.g., Larsson, Sariaslan, Langstrom, D’Onofrio, & Lichtenstein, 2014). Because ADHD runs in families and often leads to academic and occupational underachievement, high rates of unemployment in this group may contribute to an overestimation of socioeconomic disadvantage (Biederman et al., 2008; Faraone et al., 2015).

The etiology of ADHD is complex and multifactorial. Genetic studies have revealed that ADHD is a highly heritable condition. First-degree relatives of those with ADHD are two to eight times more likely to develop the disorder than the relatives of non-affected individuals (Faraone, et al., 2005). Moreover, twin studies report heritability rates ranging from 71 to 90 percent (Faraone et al., 2005; Nikolas & Burt, 2010; Thapar, Holmes, Poulton, & Harrington, 1999). Current research suggests that genetic risk is
likely caused by multiple common genetic variants of small effect size, rather than by one or two genes per se (Neale, et al., 2010; Steinhausen, 2009). Moreover, it is thought that genetic factors influence the onset, persistence, and expression of ADHD symptoms across the lifespan (Willcutt et al., 2012; Swanson et al., 2001).

Brain imaging studies have found abnormalities in the structure and functioning of the brain. Structurally, ADHD is associated with a smaller overall brain volume (e.g., Castellanos et al., 2002; Durston, et al., 2004; Faraone et al., 2015; Greven, et al., 2015), as well as smaller volumes in specific regions of the brain, including the pre-frontal cortex and cerebellum (Faraone et al., 2015; Frodl & Skokauskas, 2012; Stoodley & Schmahmann, 2009). With respect to brain functioning, functional MRI studies have provided support for underactivation across multiple neural pathways, including the frontostriatal, frontoparietal, and ventral attentional networks. There is also evidence for overactivation of the somatomotor and visual systems in individuals with ADHD relative to controls. These neural pathways are implicated in cognitive processes such as attentional control, response to reward, inhibitory control, salience thresholds, and motor behaviour (Cortese, et al., 2012; Doehnert, Brandeis, Imhof, Drechsler, & Steinhausen, 2010; Faraone et al., 2015; Plichta & Scheres, 2014). In addition to dysregulation of several brain regions and pathways, a recent meta-analysis (Scassellati, Bonvicini, Faraone, & Gennarelli, 2012) identified certain biochemical markers (e.g., norepinephrine, 3-methoxy-4-hydroxyphenylethylene glycol, monoamine oxidase, Zinc, and cortisol) that help differentiate individuals with ADHD from non-affected individuals (Scassellati et al., 2012). Despite the increases in genetic and neuroimaging studies in ADHD, the link between underlying brain abnormalities and symptom expression across
development remains unclear. At the present time, evidence supports a lag in the development of ADHD-related brain structures and functions, and this lag does not seem to completely disappear in adulthood (Almeida et al., 2010; Shaw et al., 2013; Steinhausen, 2009).

ADHD has been associated with a wide range of environmental risk factors including pre- and perinatal factors, such as maternal smoking, alcohol, and substance use, low birth weight, prematurity, maternal stress; environmental toxins, such as lead, polychlorinated biphenyls, and organophosphate pesticides; dietary influences, such as zinc deficiencies. There is also evidence of an association between ADHD and psychosocial factors, such as parental hostility and severe early deprivation (Banerjee, Middleton, & Faraone, 2007; Faraone et al., 2015; Harold et al., 2013; Milberger, Biederman, Faraone, Chen, & Jones, 1996; Skoglund, Chen, D’Onofrio, Lichtenstein, & Larsson, 2014; Stevens, et al., 2008; Thapar, Coopoer, Eyre, & Langley, 2013). Research examining environmental risk factors for ADHD is plagued by challenges such as how to identify which factors are causal versus simply correlational (Lahey, D’Onofrio, & Waldman, 2009; Rutter, 2007; Thapar & Rutter, 2009). It is likely that some observed relationships may be due to an unmeasured third variable while others may be due to child and/or parental behaviours that exert influence on the environment (Faraone et al., 2015; Thapar et al., 2013). Nonetheless, results from etiological studies strongly suggest that, in most cases, no single risk factor is necessary or sufficient to cause ADHD (Faraone et al., 2015). Rather, both neurobiological and environmental variables are implicated in the disorder and they continuously and dynamically interact over time to influence its phenotypical presentation. This
presentation includes a heterogeneous profile of brain abnormalities, neurocognitive
deficits, psychopathology, and impairment across the life span (Faraone et al., 2015;
Thapar et al., 2013).

**ADHD as a Disorder of Self-Regulation and Executive Functioning**

Several theoretical models of ADHD exist in the literature. The most influential
are neuro-cognitive in nature and consider EF deficits as central to the etiology of ADHD
(e.g., Barkley, 1997, 2006; Castellanos & Tannock, 2002; Sonuga-Barke, 2002).
Although there is no agreed upon definition of executive functioning, the term is often
used to describe a broad set of higher-order cognitive processes (e.g., set shifting,
inhibition, working memory, planning) that allows an individual to engage in flexible,
goal-directed behaviour (Castellanos, Sonuga-Barke, Milham, & Tannock, 2006).
According to an influential model proposed by Barkley (1997, 2006), ADHD and its
associated difficulties arise from a developmental delay in or acquired impairment of the
behavioural inhibition networks of the brain that disrupt self-regulation. Self-regulation
involves any self-directed action to change one’s own behaviour in order to alter the
probability of a future consequence (e.g., Barkley, 1997, 2006). In this model,
behavioural inhibition is critical to the performance of four key EFs, which in turn
influence motor control and self-regulation. These four EFs include: 1) *nonverbal*
working memory; 2) *verbal working memory* (*internalized, self-directed speech*); 3) *self-
regulation of affect, motivation, and arousal* (*self-directed emotion*); 4) *planning or
reconstitution* (*self-directed play*; Barkley, 1997, 2006). When inhibition is
compromised, as hypothesized in individuals with ADHD, the efficient performance of
these EFs and, therefore, self-regulation and adaptability, are adversely affected (Barkley, 1997, 2006).

Some aspects of Barkley’s model are well supported empirically. For instance, results of a meta-analysis examining EFs in ADHD reveal that ADHD is associated with weaknesses on measures of most EF domains using performance measures (Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). There is also evidence of weaknesses when rating scale assessments of EFs are used (e.g., Toplak et al., 2009). This association between ADHD and EF impairments remains significant even when group differences in intelligence, reading ability, or comorbid conditions are controlled (e.g., Barkley et al., 2001; Nigg et al., 1998; Willcutt et al., 2010; Willcutt et al., 2005). Furthermore, brain-imaging studies, which have found that the underlying brain structures and functions associated with EFs are compromised in adolescents with ADHD (Valera et al., 2007), provide further support for the EF challenges facing many individuals with the disorder.

Although EF impairments appear to be associated with ADHD, the claim that EF deficits are universal in the disorder is not well supported. For instance, overall effect sizes show that each specific EF deficit (including behavioural inhibition) rarely accounts for more than 10% of the variance in ADHD symptoms (Castellanos et al., 2006; Thissen et al., 2014). Studies have found that the proportion of children and adolescents with ADHD who have an EF deficit ranges from 30 to 50 percent, suggesting that weaknesses in EF are not necessary or sufficient to cause ADHD (e.g., Biederman et al., 2004; Loo et al., 2007; Nigg, Willcutt, Doyle, & Sonuga-Barke, 2005). In addition, because behavioural inhibition and EFs are linked to motor control, Barkley’s (1997, 2006) theoretical model only applies to cases in which hyperactivity-impulsivity are observed (Barkley, 1997).
Thus, executive and self-regulatory deficits may be one independent path to ADHD; however, given the heterogeneity of the disorder, it is likely that other pathways are implicated (Wicks-Nelson & Israel, 2003).

**ADHD as a Deficit in Motivation**

Other influential models of ADHD represent a departure from the dominant neuro-cognitive paradigms and emphasize a motivational dysfunction as an alternative pathway to ADHD (e.g., Douglas, 1989; Haenlein & Caul, 1987; Sergeant, Oosterlaan, & VanderMeere, 1999; Sonuga-Barke, 2002). For instance, Sonuga-Barke (1994) proposed a delay aversion hypothesis, which is based on the assumption that ADHD symptomatology and behaviours are manifestations of an underlying motivational style (delay aversion) associated with fundamental alterations in reward mechanisms. More specifically, this model suggests that individuals with ADHD are motivated to escape or avoid delay. Thus, when faced with a choice between immediacy and delay, individuals with ADHD will most often choose immediacy. When no choice is available, they will act in a way to reduce their perception of time by either creating or attending to non-temporal features of the environment. Therefore, symptoms of inattention, impulsivity, and hyperactivity are functional expressions of this delay aversion (Sonuga-Barke, 1994, 1998, 2003; Swanson, Sergeant, Taylor, Sonuga-Barke, Jensen, & Cantwell, 1998). In this model, cognitive deficits, such as working memory and planning, arise as secondary effects of delay aversion associated with patterns of reduced task engagement (Sonuga-Barke, Williams, Hall, Saxton, 1996).

There is evidence to support a motivational dysfunction and altered sensitivity to reward in individuals with ADHD. Children and adolescents with ADHD demonstrate
better performance under conditions of reward relative to controls (Luman, Oosterlaan, & Sergeant, 2005; Rosch & Hawk, 2013), and they prefer immediate over large delayed rewards under many circumstances, supporting the delay aversion hypothesis (Carlson & Tamm, 2000; Kuntsi, Oosterlaan, Stevenson, 2001; McInerny & Kerns, 2003; Sonuga-Barke, 2002, 2003; Sonuga-Barke et al., 1992). In addition, psychophysiological studies have found evidence for reduced physiological responding (i.e., differences in heart rate and skin conductance) under conditions of reward versus nonreward (Crone et al., 2003; Iaboni et al., 1997), while data from brain imaging studies highlights abnormalities in the neural circuits and dopamine receptors involved in motivation and reward processing (Cubillo, Halari, Smith, Taylor, & Rubia, 2012; Schultz, Tremblay, & Hollerman, 2000; Sonuga-Barke, Dalen, & Remington, 2003; Sonuga-Barke & Sergeant, 2005; Volkow et al., 2011). Objectively, lower rates of persistence and effort on academic tasks, higher levels of frustration when faced with a challenge, and a greater preference for easy work compared to their non-ADHD peers seem to reflect motivational impairments in children and adolescents with ADHD (Barkley, 1997; Carlson et al., 2002; Hoza et al., 2001). Children with ADHD also benefit from behaviour modification programs in which reinforcement contingencies are central (Barkley, 2002), with improvements in performance documented in school, home, and extracurricular settings (Hupp, Reitman, Northup, O’Callaghan, & LeBlanc, 2002; Kelly & McCain, 1995; Luman et al., 2005; Pelham et al., 1993; Pelham & Hinshaw, 1992; Rapport, Murphy, & Bailey, 1982). In addition, there is evidence to suggest that behaviours consistent with low motivation in adolescents with ADHD are more strongly linked to symptoms of inattention than symptoms of hyperactivity-impulsivity (Langberg et al., 2010; Power, Werba, Watkins,
Angelucci, & Eiraldi, 2006; Sasser et al., 2015), highlighting the importance of considering the role of inattention in relation to motivational variables. In a recent study by Plamondon and Martinussen (2015), researchers found that academic achievement scores in mathematics, reading, and writing were predicted by variance shared among inattention, intrinsic motivation, and behavioural engagement, rather than the unique variance explained by each of the three predictors. These findings highlight the importance of examining the shared impact of inattention and motivational variables on achievement-related outcomes.

Although theoretical models of ADHD are still evolving, the existing evidence suggests that neither the executive nor motivational models alone can fully account for the heterogeneous nature of the disorder. In recent years, more comprehensive models have been proposed, emphasizing multiple pathways to ADHD (e.g., Castellanos et al., 2006; Lopez-Vergara & Colder, 2013; Nigg, Goldsmith, & Sachek, 2004; Sonuga-Barke, 2002, 2005). These models, however, generally focus on cognitive and behavioural responses, rarely taking into account beliefs or attitudes. Thus, a comprehensive model of ADHD would be one that identifies and explains dysfunction in multiple processes, including EF, motivation, and self-perceptions, while demonstrating links to underlying neural networks in the brain (Barkley, 2014).

**ADHD and Academic Impairment**

Impairment in the academic domain is one of the most significant challenges faced by children and adolescents with ADHD (DuPaul & Stoner, 2003). Academic impairment in this population is of principal concern given that chronic underachievement in childhood is associated with reduced occupational attainment in
adulthood, as well as higher unemployment rates and lower socioeconomic status (Biederman et al., 2006; Faraone et al., 2000; Murphy & Barkley, 1996).

Poor academic outcomes are well documented in children and adolescents with ADHD. Specifically, they obtain lower scores on standardized achievement measures, have lower grade point averages, and are more likely to repeat a grade compared to their non-ADHD peers (Barbaresi et al., 2007; Bauermeister et al., 2007; Ek, Westerlund, Holmberg, & Fernell, 2011; Frazier, Youngstrom, Glutting, & Watkins, 2007; Lahey et al., 2004; Rogers, Hwang, Toplak, Weiss, & Tannock, 2011). They are also more likely to be suspended or expelled and have higher rates of absenteeism than students without ADHD (Kent et al., 2011; LeFever, Willers, Morrow, & Vaughn, 2002). A large proportion of children with ADHD experience learning difficulties, with up to 30% meeting criteria for a specific learning disability (LD; Biederman, Newcorn, & Sprich, 1991; Hinshaw, 1992). Although their IQ scores can span the spectrum of intelligence, as a group, children with ADHD tend to score slightly lower on intelligence tests than children without ADHD (Biederman et al., 1991; Jepsen, Fagerlund, Mortensen, 2009). It is not surprising given their academic challenges that children with ADHD use special education services more often than their non-ADHD peers (Jensen et al., 2004; LeFever et al., 2002). For instance, they are often placed in special education classrooms and are more likely than their peers to use ancillary services, such as remedial services, tutoring, curriculum accommodations, and after-school programs (Loe & Feldman, 2007).

A number of researchers have examined the link between the core symptoms of ADHD and underachievement in both community and clinical samples. Results from
community samples have consistently demonstrated that inattention predicts poor performance on standardized achievement measures as well as functional outcomes such as grade failure and high school dropout (Duncan et al., 2007; Fergusson & Horwood, 1995; Fergusson, Lynskey, & Horwood, 1997; Galera, Melchior, Chastang, Bouvard, & Fombonne, 2009; Gray, Martinussen, Rogers, & Tannock, 2015). In a clinical sample, Massetti and colleagues (2008) found that children with ADHD-Inattentive Type were more likely to obtain lower scores on achievement tests in adolescence than those who were diagnosed with ADHD-Combined Type. Moreover, the relationship between inattention and underachievement is not explained by co-occurring behaviors such as hyperactivity/impulsivity, conduct problems, or anxiety (Duncan et al., 2007; Massetti et al., 2008; Miller, Nevado-Montenegro, & Hinshaw, 2012; Polderman, Boomsma, Bartels, Verhulst, & Huizink, 2010), suggesting that inattention may be a unique predictor of underachievement in individuals with ADHD (Langberg et al., 2011).

**Developmental Considerations in Adolescence**

ADHD is a persistent and debilitating disorder. Although most cases are identified in childhood, studies have shown that between 70 and 80 percent of children with the diagnosis will continue to meet criteria for ADHD in adolescence (Babinski et al., 2011; Biederman et al., 2000; Biederman et al., 2010; Bussing, Mason, Bell, Porter, & Garvan, 2010; Lee et al., 2008; Sibley et al., 2012). Of those adolescents who do not qualify for a diagnosis, many will still experience subthreshold levels of symptoms as well as clinically significant impairment across multiple domains of functioning (Hinshaw et al., 2006; Lahey et al., 2004; Lee et al., 2008; Mannuzza et al., 1998; Sibley et al., 2012). Adolescence is a particularly challenging period of development for all youth, as it is
marked by physical changes, increasing social and academic demands, and the search for autonomy and a healthy sense of self (Holmbeck et al., 2006; Litner, 2003). Effectively achieving these adolescent milestones relies on a number of skills, many of which are inherently limited by ADHD (e.g., social cognition, EF, self-awareness, affect processing, motivation; Barkley, 1997; Brim & Whitaker, 2000; Da Fonseca, Seguier, Santos, Poinso, & Deruelle, 2009; Litner, 2003; Luman et al., 2005; McQuade et al., 2011; Marton, Weiner, Rogers, Moore, & Tannock, 2008; Pennington & Ozonoff, 1996; Uekermann et al., 2010). Thus, like their peers, adolescents with ADHD must effectively navigate the transition from childhood to adolescence; however, unlike their peers, they are doing so with the added challenges that result from the symptoms, cognitive deficits, and functional impairments that accompany ADHD. It is not surprising, therefore, that very few young children diagnosed with ADHD at school entry are well-adjusted once they reach adolescence (Lee et al., 2008).

The educational impairments associated with ADHD are persistent, as studies have shown that in approximately 75% of children with ADHD, poor academic outcomes continue to adolescence (Hechtman, 2000). ADHD can create a host of academic challenges for adolescents in post-secondary education. In addition to many of the academic difficulties noted in children, teens with ADHD are more likely to fail their courses, receive lower grades across subject areas, and select classes with less academically rigorous requirements. They are also more likely to be late or absent during the academic year, and are less likely to complete and turn in assignments compared to their peers without ADHD (Barbaresi et al., 2007; Barkley et al., 1990; Kent et al., 2011). Furthermore, LDs that may have been previously overlooked in the more supportive
elementary school environment can become evident with the increased demands in high school (Brook & Boaz, 2005; Robin, 1997).

Adolescents with ADHD are also at an elevated risk for high school dropout (e.g., Barbaresi et al., 2007; Barkley et al., 2006; Frazier et al., 2007). One study demonstrated that adolescents with ADHD are 2.7 times more likely to drop out before high school graduation and that they are less likely to pursue postsecondary education compared to their non-ADHD counterparts (Barbaresi et al., 2007). Furthermore, Fried and colleagues (2013) found that ADHD status predicted high school dropout in adolescents, independent of confounds such as IQ, social class, and LD status. Even in community samples of children, students with attention problems are more likely to drop out of high school than students without attention problems, suggesting that inattention may be a unique risk factor for high school dropout (Pagani et al., 2008). High school dropout is of particular concern in adolescents with ADHD, given their pre-existing cognitive and functional limitations. Moreover, it places them at high risk for the many disadvantages faced by those who do not graduate with a high school diploma, including fewer employment opportunities, lower annual incomes, and higher rates of unemployment, incarceration, poverty, and long-term dependency on social services (Appleton, Christenson, & Furlong, 2008; Barton, 2004; Trampush, Miller, Newcorn, Halperin, 2009; Christenson, Sinclair, Lehr, & Hurley, 2000).

The EF and motivational deficits that are commonly found in children with ADHD may become particularly salient during the adolescent years. Upon entering high school, the demands of the environment increase dramatically, as students are expected to be more self-directed in their learning, master more material, and juggle multiple classes
with different teachers (Robin, 1997). Therefore, it is not surprising that EF weaknesses in individuals with ADHD remain robust in adolescence (Toplack, Bucciarelli, Jain, & Tannock, 2009; Wasserstein, 2005), and these weaknesses are not accounted for by age, intellectual functioning, comorbid disorders, or gender differences (Martel et al., 2007). Similarly, critical learning skills that rely on EFs, such as studying, note-taking, test-taking, summarizing, planning, organizing, and time management, are also significantly impaired in adolescents with ADHD and have been linked to reduced academic performance (Demaray & Jenkins, 2011; Gureasko-Moore, DuPaul, & White, 2006; Meyer & Kelley, 2007; Reaser et al., 2007; Volpe et al., 2006; Zwart & Kallemeyn, 2001). Few studies have examined motivation in adolescents with ADHD longitudinally; however, research in typically developing children has found evidence for a decline in several aspects of motivation from elementary to high school (e.g., Anderman & Maehr, 1994; Eccles et al., 1998; Gottfried, Fleming, & Gottfried, 2001; Harter, 1981; Lepper, Sethi, Dialdin, & Drake, 1997; Wigfield et al., 1997). Given that underlying motivational deficits are common in ADHD (e.g. Carlson & Tamm, 2000; Kuntsi et al., 2001; Luman et al., 2005; Sonuga-Barke, 2002, 2003; Sonuga-Barke et al., 1992), the decline in motivation may be particularly pronounced in this population.

Lastly, it is important to note that ADHD symptoms manifest themselves differently from childhood to adolescence. Specifically, symptom trajectory studies have found that symptoms of hyperactivity-impulsivity tend to subside in adolescence, whereas symptoms of inattention remain constant (Biederman et al., 2000; Hart, Lahey, Loeber, Applegate, & Frick, 1995; Hurtig et al., 2007; Mick, Faraone, & Biederman, 2004). Among adolescents with ADHD, common manifestations of inattention include
procrastination, daydreaming, and indecisiveness (Robin, 1997). Although the classic hyperactive behaviours of young children tend to decrease in adolescence, classroom observers continue to document subtle forms of restlessness and minor motor behaviour in adolescents during sedentary activities (Barkley et al., 1990; Clarke, Heussler, & Kohn, 2005; Hechtman, 1989; Willoughby, 2003). Furthermore, adolescents with ADHD often report subjective or internal feelings of restlessness and feeling confined when expected to stay in one place (Barkley et al., 1990; Clarke et al., 2005; Hechtman, 1989; Robin, 1997; Wender, 1995; Weyandt et al., 2003; Willoughby, 2003). Although there may be an age-dependent decline in hyperactivity/impulsivity in individuals with ADHD, subtle manifestations of these symptoms are still visible when adolescents with ADHD are compared to their non-ADHD peers (Wender, 1995). Of note, researchers have found that EF deficits in ADHD may be more closely related to inattention symptoms than hyperactive-impulsive symptoms (e.g., Stavro, Ettenhofer, & Nigg, 2007), which are more stable across development.

**ADHD and Gender Differences**

There has been a growing body of research that has demonstrated subtle but important gender differences in the symptom presentation and psychosocial functioning of individuals with ADHD (Nussbaum, 2012; Rucklidge, 2010; Rucklidge & Tannock, 2001). For instance, researchers have consistently demonstrated that females most often present with symptoms of inattention, whereas males tend to show symptoms of hyperactivity/impulsivity (Biederman et al., 2005; Rucklidge, 2010; Weiss, Worling, Wasdell, 2003; Seidman et al., 2005). These differences in symptom presentation have lead some theorists to argue that ADHD is under-identified in girls, as inattention
symptoms are more likely to go unnoticed than the disruptive behaviours associated with hyperactivity/impulsivity (Gershon et al., 2005; Hinshaw & Blachman, 2005; Staller & Faraone, 2006). Despite differences in symptom presentation, males and females with ADHD appear to struggle equally with deficits in EF and self-regulation (Gross-Tsur et al., 2006; Hartung et al., 2002; Rucklidge, 2010; Seidman et al., 2005). Seidman and colleagues (2005) examined age and gender differences in EF in a large sample of preteens and teens (ages 9 to 17 years). Females and males with ADHD had very similar profiles of executive dysfunction, and this held true for both the younger and older age cohorts. Similarly, males and females with ADHD do not differ with respect to their scores on achievement tests (Rucklidge & Tannock, 2001).

Adolescent females with ADHD may be at a higher risk for internalizing and psychosocial problems relative to their male counterparts (Rucklidge & Tannock, 2001). Specifically, females with ADHD tend to report higher levels of distress, anxiety, and low mood compared to males with ADHD and females without ADHD (Biederman et al., 1994; Gershon & Gershon, 2002; Hinshaw, 2002; Rucklidge & Tannock, 2001; Staller & Faraone, 2006). In addition, adolescent females with ADHD rate themselves as being less accomplished, having lower self-esteem, and being more affected by negative life events compared to adolescent males with ADHD (Rucklidge & Tannock, 2001). In contrast, males with ADHD typically show more externalizing difficulties, as they tend to be more disruptive, engage in more rule-breaking, and are more likely to have comorbid Oppositional Defiant Disorder/Conduct Disorder diagnoses relative to females with ADHD (Abikoff et al., 2002; Biederman et al., 1994; Gaub & Carlson, 1997; Hartung et al., 2002). Therefore, the combination of having ADHD and being female may place
individuals at higher risk for reporting more psychological distress and psychosocial challenges (Rucklidge & Tannock, 2001), emphasizing the importance of considering gender differences in studies examining clinical outcomes in this population.

In summary, ADHD is a chronic and debilitating disorder characterized by symptoms of inattention and hyperactivity/impulsivity. Although EF/self-regulatory deficits have received considerable attention in theoretical models of the disorder, there is an increasing interest in exploring alternative pathways to ADHD, including those that emphasize a motivational dysfunction. The core symptoms of ADHD and associated self-regulatory and motivational deficits create a host of challenges for individuals with ADHD across school, home, and social settings. Academic impairment is of particular concern, especially during the adolescent years when students must cope with novel developmental demands including the need to make decisions about their future educational and career paths. However, relative to children with ADHD, adolescents have been understudied; therefore, there remains a need to pinpoint those factors that may enhance the school functioning of adolescents with ADHD in particular. Researchers investigating the connection between ADHD and achievement have isolated inattention as a key variable in accounting for poor scholastic outcomes. Given the widespread motivational deficits in individuals with ADHD, it is important to also identify prominent motivational variables, including student perceptions and behaviours, that may be of importance when considering the school functioning of this population. In addition, subtle but important gender differences in many psychosocial factors are evident in ADHD, which suggests the need to consider possible gender differences when examining important clinical outcomes.
Student Engagement

Definition

The construct of student engagement has a long history in the literature, primarily driven by an interest in how to promote student learning and enhance academic performance (Christenson et al., 2012). Despite its lengthy history, there is no agreed-upon definition of engagement among theorists (Fredricks et al., 2004), with two-, three-, and four-subtype models proposed in the literature (e.g., Appleton et al., 2006; Christenson et al., 2008; Finn, 1989; Martin, 2007; Skinner, Furrer, Marchand, & Kindermann, 2008; Skinner et al., 2009). Most researchers agree, however, that engagement is a multidimensional construct that is, at minimum, comprised of a behavioural and affective component (Christenson et al., 2012). Behavioural engagement is typically defined as the degree to which a student shows positive conduct at school (e.g., adhering to rules, the absence of disruptive behaviour), is involved in learning and academic activities (task persistence, on-task behaviour, participating in class discussion), and participates in school-based social activities, such as athletics or school committees (Fredricks et al., 2004). Emotional/affective engagement involves a student’s emotional reactions in the classroom, including interest, boredom, anxiety, a sense of belonging, and a positive attitude towards learning (Stipek, 2002). Despite being conceptually distinct, behavioural and emotional engagement are positively correlated (Fredricks et al., 2004). Some researchers have recently proposed a cognitive component to engagement that includes factors such as attention, mental effort, and self-regulation of learning (Fredericks et al., 2004; Wang, Willett, & Eccles, 2011). However, this aspect of engagement will not be considered in the present study as there are disputes in the
literature about how this concept should be defined and measured (Fredricks et al., 2004). Furthermore, because many aspects of cognitive engagement (e.g., focusing attention, resisting distractions) overlap with symptoms of inattention (Corno & Mandinach, 1983; Skinner et al., 2008), this component of engagement was not considered in the present study in order to reduce any shared variance between inattention and engagement.

Although closely related, researchers typically view student engagement and motivation as distinct constructs. Common perspectives describe motivation as the psychological processes that underlie the energy, purpose, and durability of one’s engagement with a task (Skinner et al., 2009), and address the question of “why am I doing this?” for a particular behaviour (Maehr & Meyer, 1997). Engagement is often seen as the outward manifestation of motivation, or one’s active involvement in completing a task (Appleton et al., 2008; Reeve, Jang, Carrell, Jeon, & Barch, 2004; Skinner et al., 2009). Therefore, motivation is necessary for a student to be engaged, but it is not sufficient. As such, one may be motivated to complete a task, but not actively engaged in it (Connell & Wellborn, 1991; Furrer & Skinner, 2003). Recent research has supported the hypothesis that motivation predicts engagement, which in turn, predicts achievement outcomes (Green et al., 2012; Strand et al., 2012).

When students are engaged in lessons and academic tasks, they experience increased opportunities to respond to the material, and this enhances the rate and depth of their learning (Di Perna, Volpe, & Elliot, 2002; Fisher et al., 1980; Leach & Dolan, 1985). Student engagement, particularly behavioural engagement, is a strong predictor of a range of academic outcomes (e.g., Archambault et al., 2009; Archambault & Vandenbossche-Makombo, 2014; Bandura et al., 1996; Finn & Rock, 1997; Finn &
Zimmer, 2012; Marks, 2000; Guo, Connor, Tompkins, & Morrison, 2011; Wang & Holcombe, 2010; Whitlock, 2006). It is considered one of the most important variables to examine when studying the effect of student behaviours on academic performance (Greenwood, 1996; Greenwood, Horton, & Utley, 2002). For instance, Johnson and colleagues (2006) used data from the population-based Minnesota Twin and Family Study to examine the relation between student engagement and later achievement, controlling for confounding variables. The authors found that only engagement affected grades from age 11 to age 17, beyond the contribution of IQ, externalizing behaviour, and family risk. Student engagement is also central in understanding school dropout, as there is an extensive literature demonstrating that students who are more behaviourally engaged are more likely to stay in school and aspire to higher education (Alexander, Entwisle, & Horsey, 1997; Stewart, 2008; Wang & Eccles, 2012; Wang & Holcombe, 2010). Enhancing student engagement is a key component of prevention programs designed to improve educational outcomes for at-risk adolescents and reduce high school dropout (Christenson, 2009; Christenson et al., 2008; Finn, 1989; Sinclair et al., 1998, 2005).

Students who do not fully engage in school not only miss important opportunities for academic growth and development, but they are also more likely to be involved in risky activities or experience adjustment problems. For instance, low student engagement is linked to a range of negative outcomes including substance use, delinquency, externalizing behaviour challenges, and higher depressive symptomatology (Catalano et al., 2004; Hughes, Luo, Kwok, & Loyd, 2008; Henry, Knight, & Thornberry, 2012; Li & Lerner, 2011; Loukas et al., 2009; Resnick et al., 1997; Shochet, Dadds, Ham, &
Montague, 2006). Students who report low engagement also report more dissatisfaction with school, a lower sense of belonging, and higher rates of family conflict (Christenson, Reschly, & Wylie, 2012; Corville-Smith, Ryan, Adams, & Dalicandro, 1998). Thus, the importance of understanding student engagement extends beyond its relationship with academics to social-emotional functioning and well-being.

Student engagement varies as a function of factors such as age and gender. With respect to age-related differences, Eccles and colleagues (1993) found that student engagement declines from elementary to junior high school. The authors hypothesized that these changes in engagement may be a function of a poor fit between the individual’s needs and the demands of the environment as well as having fewer opportunities for autonomy and relatedness during this critical developmental period (Eccles et al., 1993). During later adolescence, student engagement tends to stabilize, although it still remains lower than in the elementary school years (Janosz, Archambault, Morizot, & Pagani, 2008). In terms of gender differences, there is some evidence, albeit limited, to suggest that male students tend to be less engaged than female students (Elliott, DiPerna, Mroch, & Lang, 2004; Li & Lerner, 2011; Whitlock, 2006), highlighting the importance of considering the role of gender in studies of student engagement.

**Engagement in Adolescents with ADHD**

Researchers have found that students who struggle academically receive fewer opportunities to engage with academic material than their typically achieving peers (Greenwood et al., 1984; Li & Lerner, 2011; Thurlow, Yesseldyke, Graden, & Algozzine, 1984). Unfortunately, very little is known about student engagement in adolescents with ADHD, even though this population is at considerable risk for academic
underachievement, school dropout, and poor social-emotional adjustment (e.g., Loe & Feldman, 2007; Wehmeier et al., 2010). Given that engagement behaviours can be fostered to enhance educational outcomes (e.g., Christenson, 2009; Christenson et al., 2008; Reschly & Christenson, 2006), there is considerable value to understanding the role of engagement in adolescents with ADHD.

Given the symptoms, neurocognitive deficits, and functional impairments that characterize ADHD, one would expect children and adolescents with ADHD to struggle with several aspects of engagement in the classroom. Research generally supports this hypothesis. For instance, relative to their peers, students with ADHD are more likely to demonstrate challenges with on-task behaviour (Abikoff et al., 2002; Daley & Birchwood, 2010; Vile Junod, DuPaul, Jitendra, Volpe, & Cleary, 2006), and they are less likely to participate in class lessons (e.g., Steiner, Sheldrick, Frenette, Rene, & Perrin, 2014) and follow teacher instructions (e.g., Nolan, Gadow, & Sprafkin, 2001), all of which are components of behavioural engagement. Underlying motivational and EF deficits may further interfere with behavioural engagement by making it challenging for adolescents with ADHD to initiate tasks (McCandless & O'Laughlin, 2007; Willcutt et al., 2005), persist over time (Dovis, Van der Oord, Wiers, & Prins, 2012; Hoza et al., 2001), and complete homework assignments (Langberg et al., 2010; Power et al., 2006). Adhering to classroom rules and demonstrating appropriate classroom conduct may be challenging for those adolescents with comorbid externalizing difficulties (Biederman et al., 1998; Spencer et al., 2007). Furthermore, given their widespread academic and motivational challenges, it is not surprising that students with ADHD are more likely than their peers to report feeling less connected to their teachers, have a negative attitude
towards school, and report boredom and low levels of curiosity, interest, and enjoyment of learning (Carlson et al., 2002; Castens & Overbey, 2009; DuPaul & Stoner, 2003; Pfiffner, Barkley, & DuPaul, 1998; Rogers & Tannock, 2013). This pattern of findings suggests that they may also be at risk for lower levels of emotional engagement relative to their non-ADHD peers.

Although limited, there is some evidence to suggest that children with ADHD have difficulties with student engagement (e.g., Demaray & Jenkins, 2011; Martin, 2012; Vile Junod et al., 2006). For instance, Vile Junod and colleagues (2006) found that, after controlling for differences in achievement test scores and SES, children with ADHD in grades 1 to 4 had significantly higher rates of off-task behaviour and significantly lower rates of engagement relative to their non-ADHD peers. Other researchers have explored the role of student engagement as a mediating variable between symptoms of inattention and academic outcomes (Demaray & Jenkins, 2011; DuPaul et al., 2004; Langberg et al., 2011; Plamondon & Martinussen, 2015; Rapport, Scanlan, & Denney, 1999; Volpe et al., 2006). Rapport and colleagues (1991) proposed a dual-pathway model, which describes two parallel pathways—one cognitive and the other behavioural—that mediate the relationship between attention problems and achievement. The cognitive pathway implicates higher-order cognitive functions, such as memory and vigilance, whereas the behavioural pathway highlights the role of daily classroom performance, which includes the role of student engagement (Rapport et al., 1999). Rapport and colleagues tested their hypothesized model and found that teacher-rated classroom performance significantly mediated the relationship between inattention and academic achievement, such that the direct relationship was rendered nonsignificant. The overall model, including attention
problems, classroom performance, and select cognitive abilities, accounted for 77% of the variance in achievement on standardized tests.

Since Rapport and colleagues proposed their dual-pathway model, several additional studies have supported the finding that certain classroom behaviours, including school engagement, are important in explaining the relationship between ADHD symptoms and achievement (DuPaul et al., 2004; Langberg et al., 2011). For instance, two studies, Volpe et al. (2006) and Demaray and Jenkins (2011), examined the mediating role of academic enablers, which are the “attitudes and behaviours that allow a student to participate in and ultimately benefit from academic instruction in the classroom” (DiPerna & Elliott, 2002, p. 294). The enablers include student engagement as well as other behaviours and attitudes, such as interpersonal skills, motivation, and study skills. Both these studies revealed that certain academic enablers, including student engagement, mediated the relationship between ADHD symptoms and achievement in a sample of elementary school students. Similarly, given the specificity and malleability of engagement behaviours, promoting student engagement has been a target of interventions designed to enhance the educational functioning of adolescents with attention problems (e.g., Clarfield & Stoner, 2005; Martin, 2012, 2013; Pfiffner, Villodas, Kaiser, Rooney, & McBurnett, 2013).

Taken together, the above research suggests that student engagement is an important motivational construct to study when seeking to uncover those behaviours that promote positive academic outcomes. There is evidence to suggest that individuals with ADHD may struggle with several aspects of student engagement; however, only a handful of researchers have directly studied this variable in adolescents with the disorder.
This research is important given that adolescents with ADHD are at risk for poor academic functioning, including school failure and dropout, and that student engagement is a key variable in reducing the risk of these outcomes. When considering student engagement as a target of intervention, it may be particularly valuable to identify those factors that foster engagement behaviours. One such factor is self-efficacy, which will be discussed below, as these self-beliefs have been consistently linked to enhanced performance, well-being, and engagement in the classroom.

**Self-Efficacy**

*Theory and Research*

In his book *Social Foundations of Thought and Action: A Social Cognitive Theory*, Bandura (1986) put forth a theory of human agency which proposes that individuals are agents proactively engaged in shaping their own development and outcomes and that "what people think, believe, and feel affects how they behave" (Bandura, 1986, p. 25). Thus, according to this model, individuals are proactive, self-reflecting, and self-regulating beings, rather than reactive organisms who are shaped solely by environmental forces or subconscious inner drives. From Bandura’s perspective, human thought and action are the result of a dynamic interaction of personal, behavioural, and environmental factors. For example, how people interpret the results of their own behaviour informs and alters their environment and the personal factors they possess which, in turn, inform and alter subsequent behaviour.

Bandura also argued that “among the mechanisms of personal agency, none is more central or pervasive than peoples’ beliefs about their capabilities to exercise control over events that affect their lives” (Bandura, 1986, p. 1175). Bandura was referring to
self-efficacy beliefs, which are at the centre of his social cognitive theory. Bandura defined self-efficacy beliefs as subjective judgments of one’s ability to organize and execute courses of action to attain designated goals (Bandura, 1986, 1993). He proposed that self-efficacy beliefs can be measured based on their level, generality, and strength across various activities and contexts (Bandura, 1997). *Level* of self-efficacy beliefs are dependent on the difficulty level of a particular task, such as completing math problems of increasing difficulty; *generality* refers to the transferability of self-efficacy beliefs across activities, such as from addition to division problems; *strength* refers to the amount of certainty about performance on a particular task (Bandura, 1997; Zimmerman, 2000, Zimmerman, 1995). Bandura proposed that these characteristics of self-efficacy perceptions can be measured quantitatively by questionnaires with items that are task specific, vary in difficulty, and capture degrees of confidence (e.g., 0 to 100% confident) (Bandura, 1997; Pajares, 1996; Zimmerman, 2000).

Although closely related to other self-perceptions, such as self-concept, the construct of self-efficacy has several defining features that set it apart (Bandura, 1997; Zimmerman, 2000; Zimmerman & Cleary, 2006). Firstly, unlike self-concept, self-efficacy beliefs focus on *performance capabilities* (i.e., what a person thinks he/she *can do*), rather than judgments about personal qualities, such as one’s physical or psychological attributes (e.g., “I am confident that I can complete this math test” versus “I am good at math”). Secondly, whereas self-concept is a more general self-descriptive construct, self-efficacy beliefs are *domain-, task, and context-specific*. For instance, although an individual may express higher self-efficacy for math than science, within mathematics, he/she may feel more capable of completing algebra than statistics. Even
still, he/she might feel more capable of completing algebra in a quiet library than in a
noisy classroom. Thirdly, self-efficacy beliefs are dependent upon a *mastery criterion* of
performance, rather than normative data or other criteria. For example, individuals judge
their certainty in completing a math task of a certain difficulty level, rather than how well
they expect to perform relative to others. Lastly, self-efficacy beliefs are *future-oriented*
in that they are judgments made prior to performing a given task. Thus, they involve
beliefs about capability of accomplishing a task, versus whether they have done so in the
past (Bandura, 1997; Pajares, 1996; Zimmerman, 2000; Zimmerman & Cleary, 2006).

According to Bandura, self-efficacy beliefs are the driving force behind
motivation, well-being, and personal accomplishment (Bandura, 1986, 1997). He argued
that people’s beliefs about their capabilities are better predictors of performance than
their existing knowledge and skills, as people would have little incentive to persist in the
face of difficulty unless they believe that their actions can produce a desired outcome
(Pajares, 1996; Bandura, 1986, 1997; Zimmerman, 2000). Although Bandura
acknowledged that no amount of confidence can lead to success when requisite skills and
knowledge are absent, he argued that self-efficacy beliefs are powerful in that they dictate
how individuals use the knowledge and skills that they possess (Pajares, 1996; Bandura,
1986, 1997; Zimmerman, 2000). Bandura theorized that self-efficacy beliefs affect the
choices people make, how much effort they put forth, and their emotional reactions when
faced with difficulty (Bandura, 1997; Bandura, Barbaranelli, Caprara, & Pastorelli, 2001;
Bandura, Pastorelli, Barbaranelli, & Caprara, 1999; Muris, 2002). He also proposed that
these beliefs are a critical determinant of self-regulation, particularly in the context of
learning (Bandura, 1997, 2001; Pajares, 1996; Zimmerman, 2000).
Self-efficacy beliefs provide students with a sense of agency to motivate their learning through self-regulated learning strategies (Zimmerman, 2000). Self-regulated learners can effectively use strategies, such as organizing information, planning, reflecting on one’s performance, and rehearsing or using memory aids, in a manner that is directed at successfully acquiring information or academic skills (Zimmerman, 2002; Zimmerman & Martinez-Pons, 1992). Consistent with Bandura’s social cognitive theory, how confident students are in their ability to self-regulate their learning can determine how well they are able to manage their learning environment and use self-regulated learning strategies effectively (Bandura, 1993; Pajares & Urdan, 2006; Zimmerman, 2000). Thus, self-efficacy for self-regulated learning (SESRL) refers to the beliefs that students hold about their ability to use self-regulated learning strategies to cope with difficult learning conditions (Bandura, 2006).

Researchers have studied SESRL beliefs extensively in the context of student achievement and learning, with results demonstrating that these beliefs predict a range of academic outcomes (see Bandura, 1997; Pajares, 2007). Specifically, SESRL beliefs predict students’ grades, standardized achievement scores, as well as the quality and quantity of homework completion (e.g., Bandura, 1993; Kitsantas & Zimmerman, 2008; Klobas, Renxi, & Nigrelli, 2007; Lent, Brown, & Larkin, 1987; Linnenbrink & Pintrich, 2002; Pajares, 1996; Pajares & Graham, 1999; Pintrich & De Groot, 1990; Usher & Pajares, 2008; Zimmerman 1994; Zimmerman & Bandura, 1994; Zimmerman & Kitsantas, 2005, 2007; Zimmerman & Martinez-Pons, 1990). Interestingly, Zuffianò and colleagues (2013) found that SESRL beliefs at the beginning of eighth grade predicted academic achievement (students’ grades obtained from school records) at the end of the
school year, beyond the effects of previous academic achievement, socioeconomic status, intelligence, personality traits, and self-esteem. These results provide support for Bandura’s social cognitive theory and his contention that SESRL beliefs are one of the most powerful predictors of performance. There has also been a growing interest in examining the role of SESRL beliefs in high school dropout (e.g., Caprara et al., 2008; Kitsantas & Zimmerman, 2009; Schunk, 1985; Zimmerman, Bandura, & Martinez-Pons, 1992; Zimmerman & Kitsantas, 2005; 2007). Caprara and colleagues (2008) studied this relationship longitudinally and found that students’ SESRL beliefs at the junior high level contributed to their academic achievement in high school and their likelihood of completing their high school education, even after controlling for variations in prior academic performance and socioeconomic status.

Gender differences in SESRL beliefs are also evident, with girls exhibiting higher SESRL beliefs than boys (e.g., Pajares, 2002; Pajares & Valiante, 2001; Vecchio, Gerbino, Pastorelli, Del Bove, & Caprara, 2007). For example, Zimmerman and Martinez-Pons (1990) examined gender differences in self-efficacy and strategy use in a sample of 90 boys and girls in grades 5, 8, and 11. They found that girls not only exhibited more goal-setting, planning, self-monitoring, and record-keeping behaviours compared to boys, but they also felt more confident in their ability to do so.

In addition to gender differences, there are developmental variations in SESRL beliefs. In adolescence, a strong sense of SESRL is especially important, as adolescents face a major shift in the difficulty of academic work and must also become more independent and assume responsibility for their own learning (Wigfield, Eccles, & Pintrich, 1996; Zimmerman & Cleary, 2006). They are also expected to develop and
apply a number of general learning skills such as note-taking, reading, essay-writing, studying, and test-taking (Zimmerman, Bonner, & Kovach, 1996). However, as they enter the teenage years, adolescents also develop more self-awareness as well as the increased ability to self-reflect, integrate evaluative feedback from others, and make social comparisons (Eccles, Wigfield, & Schiefele, 1998; Richman, Hope, & Mihalas, 2010; Wigfield, Eccles, & Rodriguez, 1998). Consequently, they are able to make more accurate self-appraisals of their abilities and skills than they would have as children (Harter, 1999; Stipek, 1998). Self-efficacy theorists have suggested that the beliefs that young people hold about their abilities can help them navigate the challenges involved in applying self-regulation skills and coping with the many learning demands of high school (Bandura, 2006; Pajares & Urdan, 2006; Zimmerman, 2000; Zimmerman & Cleary, 2006). Unfortunately, existing evidence suggests that, with the transition from elementary to high school, adolescents experience a decline in self-efficacy, including their SESRL beliefs (Caprara et al., 2008; Pajares & Valiante, 2002; Usher & Pajares, 2008; Vecchio et al., 2007). For example, Caprara and colleagues (2008) examined the developmental progression of SESRL beliefs in a group of 412 Italian students between the ages of 12 to 22 years. They found that adolescents experienced a gradual decrease in their SESRL beliefs from junior to senior high school and that this decline was greater for male students than female students. In addition, the authors found that, after controlling for socioeconomic status, students who experienced less of a decline in their SESRL beliefs were more likely to achieve higher grades and less likely to drop out of high school. Thus, adolescence is a period during which students feel less confident in their self-regulatory abilities. Unfortunately, this comes at a time during which academic
achievement is key in determining the academic and vocational opportunities that become available to adolescents (Bandura, 2006; Pajares & Urdan, 2006). This may be particularly problematic for adolescents with ADHD, who are already at a greater risk for poor academic and vocational outcomes compared to their typically developing peers. Furthermore, relative to children with ADHD, there is meagre research on adolescents, which limits our understanding of ADHD across the life-span (Faraone, 2013). By exploring self-efficacy and student engagement in adolescents with ADHD, this study will add to the current adolescent literature.

**Self-Efficacy and Student Engagement**

The negative consequences of student disengagement, including academic failure, delinquency, and dropout, have prompted many researchers to explore whether it is possible to foster the psychological factors of individuals that enhance engagement (Caraway et al., 2003). Bandura’s social cognitive theory states that self-efficacy beliefs are a key cognitive variable that influences motivation and, in particular, student engagement (Bandura, 1986, 1997; Schunk & Mullen, 2012). Indeed, there is a substantial amount of literature demonstrating that general self-efficacy and SESRL beliefs affect several aspects of student engagement in the classroom. For instance, students who feel more confident in their self-regulation skills are able to use these skills more effectively. They set challenging goals, monitor and evaluate their progress, and employ a range of learning strategies across academic domains (Bandura et al., 1996, 2001; Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003; Bong, 2001; Zimmerman & Bandura, 1994; Zimmerman, Bandura, & Martinez-Pons, 1992; Zimmerman & Martinez-Pons, 1990). They also focus their attention on the task at hand,
put forth a more consistent effort, and strive to avoid distraction (Linnenbrink & Pintrich, 2003; Schunk, 1995; Schunk & Mullen, 2012; Zimmerman, 2000). When self-efficacious students perceive that their progress is inadequate, they take the appropriate steps to enhance their learning, such as changing a strategy, seeking assistance, or modifying aspects of the environment (Linnenbrink & Pintrich, 2003; Schunk & Mullen, 2012).

Consistent with social cognitive theory, Bouffard-Bouchard and colleagues (1991) found that self-efficacy exerted a significant influence on various aspects of self-regulation in a population of junior and senior high school students who were asked to complete problems of varying difficulty. Specifically, students with higher self-efficacy beliefs were more likely to monitor their work time, persist on the task, and use effective problem-solving methods than students with lower self-efficacy beliefs, irrespective of differences in grade level and cognitive ability.

Students who feel more confident in their ability to self-regulate their learning are also more likely to hold positive outcome expectations, value the learning process, set mastery goals, and take responsibility for their academic outcomes (e.g., Bandura, 1993; Lent et al., 1987; Linnenbrink & Pintrich, 2002; Pajares, 1996; Pajares & Graham, 1999; Pintrich & De Groot, 1990; Usher & Pajares, 2008; Zimmerman & Bandura, 1994; Zimmerman & Kitsantas, 2007; Zimmerman & Martinez-Pons, 1990). These are all important aspects of student engagement. Furthermore, students who feel more efficacious about using self-regulated learning strategies are also less likely to hold negative perceptions about school, set performance (versus mastery) goals, procrastinate, or become anxious in threatening academic situations relative to their peers with lower SESRL beliefs (e.g., Joo, Bong, & Choi, 2000; Pajares, 1996; Pajares & Graham, 1999;

Some researchers have directly examined the relationship between self-efficacy beliefs and measures of student engagement (Caraway et al., 2003; Walker et al., 2006). For instance, Caraway and colleagues (2003) sought to identify psychological variables that facilitate or hinder engagement in a sample of 123 adolescents ages 13 to 19. Results indicated that adolescents with higher levels of self-efficacy were more likely to be engaged in various aspects of school and achieve higher grades. Similarly, using path analysis, Walker et al. (2006) found that self-efficacy beliefs, along with other psychological variables such as intrinsic motivation and academic identification, uniquely contributed to the predication of cognitive engagement. Taken together, the above research suggests that SESRL beliefs affect several aspects of engagement, including student behaviours and their emotional responses towards learning.

*Self-Efficacy and ADHD*

Research examining self-efficacy beliefs in individuals with ADHD is limited to a few studies in clinical and community samples of children and adolescents, yet this research is of critical importance given the vital role that self-efficacy beliefs play in student engagement and learning. Of the existing studies, there is some evidence to suggest that adolescents with ADHD have lower self-efficacy beliefs than their non-ADHD peers (Luzzo, Hitchings, Retish, & Shoemaker, 1999; Major, Martinussen, & Wiener, 2013; Norvilitis, Sun, & Zhang, 2010; Norwalk, Norvilitis, & MacLean, 2009; Young, Heptinstall, Sonuga-Barke, Chadwick, & Taylor, 2005). For example, Young and
colleagues (2005) followed a community sample of girls showing pervasive hyperactivity and conduct problems across an 8-year span beginning from age 7. Of note, Young et al.’s measure of hyperactivity also included items that assessed symptoms of inattention, such as distractibility and sustaining attention. They found that childhood symptoms of ADHD, not conduct problems, were a risk factor for low confidence related to school performance in adolescence. Similar results have been found in college students with respect to their decision-making about their future career (Tomevi, 2013; Norvilitis et al., 2010; Norwalk et al., 2009). Specifically, students with higher levels of self-reported ADHD symptoms also felt less confident in their ability to effectively make decisions about, and plan for, their careers and education. Furthermore, results of the regression equation predicting career decision-making self-efficacy revealed that, even after controlling for depression and gender, inattention emerged as a significant predictor of career decision-making self-efficacy, whereas hyperactivity did not (Norwalk et al., 2009).

Similar results have emerged in clinical samples. Tabassam and Grainger (2002) reported that the academic self-efficacy beliefs of children with LDs with and without co-morbid ADHD were lower than those of the children in the control group. Furthermore, Major et al. (2013) found that adolescents with ADHD, particularly females, reported the lowest levels of confidence in their ability to self-regulate their learning relative to their non-ADHD counterparts. Similar to the results found from Norwalk et al. (2009), Major and colleagues (2013) found that symptoms of inattention, but not symptoms of hyperactivity-impulsivity, were related to SESRL beliefs. This finding adds to the growing body of literature suggesting that inattention is more strongly associated with
negative outcomes than hyperactivity. Norwalk and colleagues reasoned that the greater cognitive and EF deficits found in inattentive students may make it difficult for them to plan ahead for their future, self-reflect, divide their attention, and demonstrate the self-control necessary to make decisions about their future career goals. In addition, poorer academic adjustment found in students with inattentive symptoms may also make these students feel less confident in their ability to achieve their educational and vocational goals (Norwalk et al., 2009). Although Norwalk et al.’s (2009) study focused on career decision-making self-efficacy, their approach can be applied to understanding the SESRL beliefs in adolescents with ADHD, as these two forms of self-efficacy rely on similar strategies and skills associated with self-regulation (i.e., planning, goal setting, self-reflecting, etc.).

Additional support for the hypothesis that adolescents with ADHD may demonstrate lower SESRL beliefs than their peers comes from a recent qualitative study by Wiener and Daniels (2015) in which 12 adolescents with ADHD (ages 14 to 16) described their school experiences. In this study, the researchers found that students with ADHD demonstrated low levels of personal agency, and that this emerged as one of the most striking themes across interviews. Participating adolescents readily identified their performance deficits related to academics and self-regulation of learning (e.g., inadequate study skills, procrastination, limited planning and goal-setting) and attributed these difficulties to limited personal agency—or what adolescents described as “laziness.” Participants with ADHD also acknowledged the increased demands for independence and autonomy in adolescence and secondary school, and they perceived themselves as being unable to fulfill these demands due, in part, to low levels of personal agency.
The above research provides support for the hypothesis that, as a group, adolescents with ADHD may perceive themselves as being less capable than their non-ADHD peers in managing the demands of secondary school and utilising the appropriate self-regulation skill to support their learning. In addition, research by Major and colleagues (2013) highlights the importance of considering possible gender differences in the self-efficacy perceptions of adolescents with ADHD. However, this research is still in its infancy and the latter study’s findings must be interpreted carefully due to the small sample size of adolescent females with ADHD. It is therefore important to determine whether we can replicate these findings in future studies. Establishing whether there are group and gender differences in SESRL beliefs would add to our growing knowledge of how adolescents with ADHD perceive themselves and their abilities, an essential component of adolescent development and well-being. Although self-perceptions, such as self-esteem and self-concept, have been studied extensively in children with ADHD (see Owens, Goldfine, Evangelista, Hoza, & Kaiser, 2007 for a review), few researchers have examined these self-beliefs during the adolescent years—a time when even typically developing adolescents tend to make more negative judgments about their capabilities (Caprara et al., 2008; Harter, 1999; Pajares & Valiante, 2002; Stipek, 1998; Usher & Pajares, 2008; Vecchio et al., 2007). Existing literature regarding general self-perceptions (i.e., self-concept and self-esteem) supports the hypothesis that adolescents with ADHD may have lower self-efficacy beliefs than their peers (e.g., Anderson, Williams, McGee, & Silva, 1989; Edbom, Granlund, Lichtenstien, & Larsson, 2008; Hinshaw et al., 2006; Rucklidge & Tannock, 2001; Young et al., 2005). For example, Slomkowski, Klein, and Mannuzza (1995) found that after controlling for the presence of a current mental
disorder, adolescents and young adults ages 16 to 23 who had ADHD symptoms in childhood displayed lower self-esteem than adolescents who did not have ADHD symptoms in childhood. Moreover, researchers found that in the hyperactive and control groups, adolescents with higher self-esteem rated themselves as having fewer ADHD symptoms and were judged by clinicians to have better psychosocial functioning. In terms of gender differences, female adolescents with ADHD have been found to exhibit lower self-esteem compared to male adolescents with ADHD, in addition to other psychosocial difficulties such as higher levels of anxiety and depression, increased feeling of distress, and poorer coping skills (Rucklidge & Tannock, 2001; Rucklidge, 2010; Young et al., 2005). Although self-esteem and self-concept are conceptually different from self-efficacy, the above findings from studies in adolescents, college students, and young adults with ADHD symptoms suggest that adolescents with ADHD may have more negative views of themselves and their abilities compared to their non-ADHD peers. If this is indeed the case, it may be of added value to uncover those variables that foster a healthy sense of self-efficacy in adolescents, as these can serve to inform academic interventions for adolescents with ADHD.

Sources of Self-Efficacy

Theory and Research

Embedded in his social cognitive theory, Bandura (1997) proposed that individuals form their self-efficacy beliefs by interpreting information from four main sources: (1) mastery experiences; (2) vicarious experiences (modeling); (3) verbal (social) persuasion; and (4) physiological and affective states. The most powerful of the four sources of self-efficacy are mastery experiences. They are defined as one’s reflective
assessment of past successes or failures with a task. Thus, after completing a particular task, individuals will naturally interpret and evaluate the results obtained, and judgments of competence with the task are subsequently formed based on these reflections. When individuals perceive their efforts to be successful, their self-efficacy related to accomplishing a similar task in the future is increased. When individuals believe that their efforts did not produce the desired effect, their confidence to succeed with a similar task in the future is reduced (Bandura, 1997; Usher & Pajares, 2006). Self-efficacy beliefs are informed when one’s actions or performance are cognitively appraised. Therefore, perceptions of mastery experiences are often better predictors of self-efficacy than objective results (Bandura, 1986, 1997; Usher & Pajares, 2006).

In addition to interpreting the results of their own performance, individuals form their self-efficacy beliefs through the vicarious experience of observing and interpreting the performance of others (Usher & Pajares, 2006). In other words, modeling can be a very influential in the development of self-efficacy beliefs. Moreover, the more closely the observer identifies with the model, the more likely the efficacy of the observer will change (Bandura, 1986, 1997; Schunk, 1987). Vicarious information can also be very potent when students are uncertain about their own abilities or have limited experience with the task. Thus, observing a model successfully complete a difficult task may convince people that they can also succeed at the task. Similarly, watching a model fail with such a task can decrease the observer’s efficacy (Bandura, 1986, 1997; Usher & Pajares, 2006). Vicarious experiences in academic settings are also relevant to appraising the performance of one’s peers relative to their own performance. For instance, self-
efficacy with a task may increase if one judges his/her performance as superior to his/her peers or decrease if they feel they are performing worse (Usher & Pajares, 2006).

The third source of self-efficacy according to Bandura (1986, 1997) involves the verbal (social) persuasions that individuals receive from significant others. Verbal/social persuasion involves the feedback a student receives from others, such as parents, teachers, coaches, and peers. As students are developing their sense of competence in an area, they often rely on evaluative feedback from others. The effectiveness of this feedback depends on the perceived expertise, trustworthiness, and credibility of the persuader (Bandura, 1986). Bandura also argued, however, that verbal persuasions are limited in their ability to create long-lasting increases in self-efficacy and that it may be more common that verbal persuasions undermine self-efficacy than boost it (Bandura, 1986). Nonetheless, supportive messages and positive encouragement can serve to increase students’ efforts and self-confidence, particularly when accompanied by other conditions that breed success (Usher & Pajares, 2006).

Lastly, emotional and physiological states inform self-efficacy beliefs. These states include arousal levels, fatigue, anxiety, and stress. Students can attend to and interpret these physiological cues and use this information to provide insight into how well they may accomplish a task. For instance, when a task incites feelings of stress or anxiety, these cues can undermine students’ self-efficacy beliefs because students’ may view them as signals of impending failure. Furthermore, individuals with low self-efficacy are more likely to negatively interpret past experiences than those with high self-efficacy, which may heighten their anxiety about completing such tasks in the future and lead to avoidance behaviour. Conversely, students with higher self-efficacy beliefs may
not be as affected by negative physiological states or previous failed experiences (Bandura, 1997). In general, increasing an individual’s physical and psychological well-being and reducing negative emotional states can strengthen self-efficacy and expected success with a task (Bandura, 1986, 1997; Usher & Pajares, 2006).

Although there is significant support for the predictive power of self-efficacy beliefs, fewer researchers have examined the sources of these beliefs, and the existing evidence is mixed. Most research is consistent with Bandura’s (1986, 1997) theory and has found a relationship between each of the four sources of self-efficacy and both academic and self-regulatory efficacy (Anderson & Betz, 2001; Chen & Usher, 2013; Joët, Usher, & Bressoux, 2011; Kiran & Sungur, 2012; Klassen, 2004; Lent et al., 1991; Lent et al., 1996; Lopez et al., 1997; Usher & Pajares, 2006; van Dinther, Dochy, & Segers, 2011). However, other researchers have found that not all four sources predict self-efficacy beliefs, and that some show stronger relationships with self-efficacy than others (e.g., Bandura, 1997; Butz & Usher, 2015; Hampton, 1998; Lopez & Lent, 1992; Usher & Pajares, 2008). Mastery experiences are theorized as the most influential source of self-efficacy (Bandura, 1986, 1997), and this is indeed consistent with most research findings (e.g., Anderson & Betz, 2001; Chen & Usher, 2013; Joët et al., 2011; Kiran & Sungur, 2012; Klassen, 2004; Lent et al., 1991; Lent et al., 1996; Lopez et al., 1997; Usher & Pajares, 2006; van Dinther et al., 2011). Researchers have attributed the differences among the findings of studies investigating the sources of self-efficacy and self-efficacy beliefs to subtle differences in the research methodologies used to investigate the source variables as well as individual differences related to the participants (Usher & Pajares, 2008). Although limited, there is some evidence that the
effects of the sources may differ as a function of gender. For instance, studies among high school and college students have found that females tend to report more experiences of verbal persuasion and vicarious learning than do males (Anderson & Betz, 2001; Butz & Usher, 2015; Lent et al., 1996; Usher & Pajares, 2006; Zeldin & Pajares, 2000). Some researchers have concluded that the feedback female students receive from others may be a more important contributor to their self-efficacy beliefs than their actual experiences of success or failure with the task (Zeldin & Pajares, 2000). Males students tend to weigh mastery experiences more heavily in comparison (Usher & Pajares, 2006; Zeldin & Pajares, 2000). In addition, the four sources of self-efficacy may differ as a function of ability level. Studies of students with LDs have revealed that these students tend to report fewer mastery experiences in school, less frequent exposure to efficacious models, less positive feedback from others, and higher levels of negative physiological arousal than their non-LD peers (Hampton, 1998; Hampton & Mason, 2003; Usher & Pajares, 2006). Similarly, Usher and Pajares (2006) found that academic and self-regulatory efficacy in students with below average reading abilities was related to the four sources of self-efficacy.

Bandura’s model of self-efficacy emphasizes the mediating role of self-efficacy beliefs between sources of information and achievement-related outcomes (Bandura, 1986, 1997). Consistent with Bandura’s full model, a number of research studies (Bong, 2001; Fenollar et al., 2007; Liem et al., 2008; Pajares, 1996; Pajares & Graham, 1999; Pajares & Miller, 1994; Pajares & Valiante, 1997; Phan, 2010; Prat-Sala & Redford, 2010; Sins et al., 2008) have identified the central mechanism of personal self-efficacy between antecedents and student learning and achievement. For instance, Phan (2012)
tested this model longitudinally and explored the interrelations between antecedents (i.e., four sources of self-efficacy), self-efficacy beliefs, and academic achievement in a sample of 332 elementary school students. Structural equation modeling revealed that mastery and vicarious experiences exerted a positive effect on self-efficacy beliefs, which in turn, contributed to the prediction of academic achievement. The author concluded that self-efficacy does not act in isolation, but rather operates in tandem with other antecedents to influence academic performance. Furthermore, because direct, indirect, and total effects were examined, a priori and a posteriori, support for self-efficacy as a mediator between the sources and achievement-related outcomes was provided.

Moreover, Hampton and Mason (2003) tested Bandura’s full self-efficacy model in a sample of 278 high school students with and without LDs. By using structural equation modelling, the researchers examined the relations among the sources of self-efficacy, academic self-efficacy beliefs, and academic achievement, with gender and LD status as moderating variables. Results indicated that LD status had an indirect effect on self-efficacy beliefs through an aggregated score representing the four sources of self-efficacy. In addition, the sources of self-efficacy had a direct effect on academic self-efficacy beliefs, which, in turn, affected academic performance. In this study, gender did not have a direct or indirect influence on self-efficacy beliefs. The structural model fit the data well, explaining 55% of the variance in academic achievement. Taken together, these studies provide support for Bandura’s self-efficacy model and the mediating role of self-efficacy between the sources and subsequent performance. Whether this model holds true in a sample of adolescents with attention difficulties has yet to be determined.
The Sources of Self-Efficacy and ADHD

Lent and Hackett (1987) first suggested that students with disabilities may have less access to sources of self-efficacy and that this reduced access may influence the development of self-efficacy in these individuals. Although there is research investigating the sources in adolescents with LDs (Hampton, 1998; Hampton & Mason, 2003), there is no known research examining the sources of self-efficacy beliefs in adolescents with ADHD. Similar to students with LD, many adolescents with ADHD experience a host of challenges in school, and these challenges may affect their access to mastery experiences, vicarious learning, and positive feedback from others, and may heighten their levels of negative physiological arousal.

Adolescents with ADHD are likely to experience fewer mastery experiences in school due to their widespread academic difficulties. Educational impairments are well documented in students with ADHD, with prevalence rates for learning and/or achievement problems in adolescents between 50 to 80 percent (DuPaul & Stoner, 2014). Adolescents with ADHD are more likely to fail a grade, have lower grade point averages, and score lower on standardized achievement tests than their non-ADHD peers (Barbaresi et al., 2007; Barkley et al., 2006; Ek et al., 2011; Frazier et al., 2007; Rogers et al., 2011). In addition, critical self-regulatory skills that rely on EFs, such as studying, note-taking, test-taking, summarizing, planning, organization, and time management are also significantly impaired in students with ADHD, and have been linked to reduced academic performance (Demaray & Jenkins, 2011; Gureasko-Moore et al., 2006; Meyer & Kelley, 2007; Reaser et al., 2007; Volpe at al., 2006; Zwart & Kallemeyn, 2001). Because of their academic and self-regulatory impairments, adolescents with ADHD may
be less likely to master such tasks and more likely to experience repeated failure relative
to their non-ADHD peers. These repeated failure experiences may become internalized
over time, and this may weaken their beliefs about their abilities. The impact of skill
deficits on the self-perceptions of adolescents with ADHD was recently highlighted in a
qualitative study by Wiener and Daniels (2015). In this study, participating adolescents
described their performance deficits related to note-taking, study skills, goal-setting,
planning, etc., and attributed these to low levels of personal agency. The adolescents in
this study understood that these difficulties had a negative impact on their academic
performance and they perceived themselves as being unable to meet the increased
academic and social demands of high school. Thus, adolescents with ADHD may come
to expect a challenge on academic and/or self-regulatory tasks and may be less likely to
attempt such tasks in the future or to persist in the face of difficulty. For a population of
youth who already struggle significantly with academic tasks and self-motivation, the
impact of low self-efficacy is likely even more detrimental to their learning.

Adolescents with ADHD may have less access to efficacious models, which may
also have a deleterious effect on their self-efficacy beliefs. According to Bandura (1986,
1997), modelling, or vicarious learning, is most effective when the observer and the
model share similar qualities. Studies have found that only half of students diagnosed
with ADHD will access appropriate services (Hoagwood, Kellher, Feil, & Comer, 2000),
with stigma and embarrassment being the main barriers (Bussing et al., 2012). Therefore,
high school students with ADHD may be spending more time in mainstream classrooms
where they are surrounded by peers who are likely having more success in school than
they are. Although their typically developing peers may indeed be modelling success, this
may not have the bolstering effect on their self-efficacy beliefs given that adolescents with ADHD may be sensitive to their academic differences and may not identify with their typically developing peers in this realm. For youth with ADHD, it is likely that being in the presence of students for whom success comes more easily may have a particularly detrimental effect on their self-efficacy beliefs. Even if adolescents with ADHD are among peers of similar ability levels, given their shared academic and cognitive weaknesses, both groups may struggle to succeed at academic or self-regulatory tasks.

Teachers play an important role in providing students with the positive encouragement they need to build their sense of security, confidence, and well-being at school (Bandura, 1997; Hamre & Pianta, 2001). There is evidence to suggest that, in students with emotional or behavioural challenges, the quality of the teacher-student relationship may be compromised (Murray & Zvoch, 2011), and this may lead to negative patterns of interaction, including less verbal encouragement towards these students. For instance, Rogers and colleagues (2015) found that children with symptoms of ADHD (particularly females) and their teachers reported a weaker emotional bond and less collaboration in their relationship with each other. Furthermore, among those with ADHD symptoms, a strong bond was associated with more internal motivation, highlighting the potential link between positive teacher-student interactions and self-efficacy beliefs. In addition, the authors argued that, because they measured ADHD symptoms rather than a clinical diagnosis of the disorder, barriers in the teacher-student bond were likely attributable to the core symptoms of ADHD, rather than the label itself. Additional research in the area of ADHD and teacher perceptions has highlighted other
possible barriers in the student-teacher relationship that may lead to less verbal persuasions towards adolescents with ADHD. For instance, many teachers report having limited knowledge about ADHD (Arcia et al., 2000), lower confidence in teaching these students (Ohan et al., 2011; Taylor & Larson, 1998), and that they find children with ADHD more effortful and stressful to teach (Atkinson, Robinson, & Shute, 1997; Greene et al., 2002). Teachers are also more likely to perceive a child with ADHD less favorably than a child without ADHD with regards to intelligence, personality, and behaviour (Batzle et al., 2010). Thus, lack of appropriate knowledge and negative perceptions towards ADHD may foster a negative interaction style towards adolescents with ADHD, thereby exposing them to less positive verbal encouragement relative to their non-ADHD peers. Less verbal encouragement from teachers can further compromise the self-efficacy beliefs of adolescents with ADHD.

Adolescents with ADHD may also be more prone to experiencing negative emotional states, and this may affect their sense of self-efficacy. Emotional disturbances such as depression, anxiety, and low self-esteem are common in individuals with ADHD (see Barkley, 1998, for a discussion) as well as in those with symptoms of the disorder (e.g., Herman, Lambert, Ialongo, & Ostrander, 2007; MacPhee & Andrews, 2006). In a recent longitudinal study by Lee and colleagues (2008), researchers found that 37% of adolescents who were diagnosed with ADHD in preschool experienced internalizing difficulties in adolescence, compared to 10% of adolescents in the comparison group. In addition, some researchers have connected higher levels of internalizing symptoms in adolescents with ADHD with lower levels of self-esteem (e.g., Treuting & Hinshaw, 2001), emphasizing the potential link between negative emotional states and reduced
feelings of competence in this population. Furthermore, ADHD is commonly conceptualized as a disorder of self-regulation, with increasing attention being given to the regulation of emotion (Barkley & Fischer, 2010; Melnick & Hinshaw, 2000; Wehmeier et al., 2010). More recently, Musser and colleagues (2011) sought to extend this research by examining the physiological mechanisms related to emotion regulation in ADHD. Researchers found that, unlike typically developing children who showed more variation in parasympathetic activity according to task demands and emotion valence, children with ADHD demonstrated a stable pattern of elevated parasympathetic activity across all task conditions. The authors concluded that ADHD in childhood is associated with abnormal parasympathetic mechanisms involved in emotion regulation, making it more difficult for them to respond to their emotions in a flexible and effective manner. 

Taken together, the above research suggests that adolescents with ADHD may be more prone to experiencing negative emotional states, such as anxiety and depression, as well as heightened physiological arousal and difficulties regulating their emotions. Therefore, when attempting novel, challenging, or previously unsuccessful tasks, adolescents with ADHD may be more prone to experiencing intense and stable emotional reactions, which may send signals about expected success or failure. Feeling upset, anxious, or hopeless combined with a limited ability to moderate such feelings, may lead adolescents with ADHD to believe that they are not capable of performing that task, thereby decreasing their motivation and persistence.

In summary, Bandura’s social cognitive theory (1986, 1997) provides a conceptual framework for understanding self-efficacy beliefs, including how these beliefs are formed and how they relate to subsequent learning and achievement. Although this
framework has been studied in typically developing children and adolescents as well as in adolescents with LDs, we know very little about how this model might apply to adolescents with ADHD. Evidence to date suggests that, as a result of the characteristics inherent in the disorder, adolescents with ADHD may be limited in their access to the sources of self-efficacy, which may subsequently hinder the development of their SESRL beliefs. This may have a detrimental effect on the learning and academic engagement of adolescents with ADHD, who already struggle considerably with many aspects of their school functioning.

**Rationale and Objectives of the Current Study**

The above literature review emphasizes the need to further our knowledge regarding the adolescent experience of individuals with ADHD, including how engaged they judge themselves to be in school and whether they perceive themselves as capable learners. To date, much of the research examining predictors of academic functioning in children and adolescents with ADHD has focused on cognitive factors (e.g., EF, processing speed, intelligence). It is well known that adolescents with ADHD also demonstrate deficits in motivation (e.g., Barkley, 1997; Carlson et al., 2002; Hoza et al., 2001), yet very few researchers have isolated and examined key motivational variables, such as self-efficacy and student engagement, in adolescents with ADHD. This research is of critical importance, as student engagement and self-efficacy beliefs are considered to be powerful predictors of academic outcomes, such as higher levels of academic achievement and the likelihood that adolescents will stay in school and aspire to higher education (Alexander et al., 1997; Pajares, 1996; Stewart, 2008; Wang & Eccles, 2012; Wang & Holcombe, 2010). Given that adolescents with ADHD are at a significant risk
for negative academic outcomes, including underachievement and high school dropout (e.g., Barbaresi et al., 2007; Barkley et al., 1990; Biederman et al., 2006; Faraone et al., 2000; Murphy & Barkley, 1996; Kent et al., 2011), identifying those variables that may reduce the likelihood of such outcomes is an important research goal. Low SESRL beliefs may limit the effort that adolescents with ADHD put forth on self-regulated learning tasks, and the combination of academic skill deficits and less optimistic beliefs related to self-regulation may be particularly detrimental to the educational success of these students. By extending this research further and examining the sources of self-efficacy in adolescents with ADHD, this study may also provide insight into those factors that may support or hinder the development of self-efficacy in this population.

Given that self-efficacy beliefs and student engagement are key aspects of motivation (Bandura, 1986, 1997; Schunk & Mullen, 2012), this research would also add to our understanding of the motivational dysfunction that is commonly found in ADHD—a topic that is of growing interest in the literature and is central to many theoretical models of the disorder. Furthermore, because a majority of the research base in ADHD focuses on children, understanding the adolescent experience of individuals with ADHD can help fill this gap in the literature and provide researchers with a better understanding of ADHD across different periods of development. The study of self-efficacy, particularly as it pertains to self-regulation, is especially important in adolescence because of the shift toward more self-directed learning that occurs during this period of development. In high school, adolescents must assume more responsibility for their learning and education and develop diverse self-regulatory skills to cope with the increasing demands of school (Holmbeck et al., 2006; Litner, 2003; Zimmerman,
A strong sense of self-efficacy supports students’ use of self-regulation skills and their ability to engage more fully in school (Bandura, 1997, 2000; Zimmerman, 2002).

This dissertation aims to (1) determine whether male and female adolescents with and without ADHD differ in terms of the sources of self-efficacy, their SESRL beliefs, and their levels of engagement at school, and (2) examine the relations among inattention, the sources of self-efficacy, SESRL, and student engagement. To address the first objective of this study, group and gender differences across all relevant dependent variables will be examined. Based on the existing research in community and clinical samples of adolescents with attention difficulties, I hypothesize that adolescents with ADHD will rate their SESRL beliefs and student engagement as lower than their non-ADHD peers. Studies in adolescents with LDs provide support for the hypothesis that adolescents with ADHD will also rate themselves as having less access to the four sources of self-efficacy. Because gender differences are evident in the sources of self-efficacy, SESRL, and student engagement, gender will be included as an independent variable in the analyses.

Path analysis will be used to address the second objective of this study, which is to examine the relations among inattention, the sources of self-efficacy, SESRL, and school engagement. Based on Bandura’s theory and the existing literature, a hypothesized model of the relations among the variables will be established and tested in the full sample (see Figure 1). Previous research has identified symptoms of inattention as more problematic with respect to academic functioning and self-efficacy beliefs, which justified including inattention symptoms in the analysis and exploring the role of inattention as it relates to Bandura’s model. Therefore, I hypothesize that SESRL beliefs
will play a mediating role in the relationship between the sources and student engagement. I also predict that the relationship between inattention and subsequent student engagement will be mediated by the sources of self-efficacy and SESRL.
Hypothesized Model Depicting the Relations among Parent-Rated Inattention, the Sources of Self-Efficacy, SESRL, and Student Engagement
CHAPTER 3

METHOD

Participants

The sample comprised 98 14 to 16 year-old adolescents: 47 (30 males, 17 females) were classified as having ADHD, and 51 (19 males, and 32 females) were a typically functioning comparison group. To be included in the study, adolescents in the ADHD sample were required to have: (a) a previous diagnosis of ADHD from a physician or mental health professional (as reported by parents/guardians); (b) evidence for ongoing ADHD symptomatology as confirmed by clinically significant scores (T-score ≥ 70) on at least one of the core ADHD indices (i.e., DSM-IV Hyperactive Impulsive, DSM-IV Inattentive, and DSM-IV Global) of the Conners 3 Parent Rating Scale, Long Form (Conners 3-P; Conners, 2008); (c) a Full-Scale IQ of 70 or greater1 on the Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999); (d) the ability to fluently speak, understand, and read in English, as the assessment questionnaires and tasks were validated and completed in English; and (e) no evidence of a significant neurological, psychiatric, sensory, or physical disability (e.g., traumatic brain injury, pervasive developmental disorder, psychosis, blindness) that would preclude their ability to complete the assessment battery (according to parent report). Despite efforts to recruit females with ADHD, we were only able to recruit 17 within the study period.

Analogous inclusion criteria were used for the adolescents in the comparison sample: (a) no parent-reported previous or current diagnosis of ADHD or other

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1 Two of the participants with ADHD had a Full-Scale IQ below 70 on the WASI; however, both were included in the final sample because they obtained a standard score of 70 or above on either the verbal or nonverbal subtests.
behavioural disorder; (b) scores in the normal range of functioning (T-scores ≤ 65) on the DSM-IV scales of the Conners 3-P; (c) a Full-Scale IQ of 70 or above on the WASI; and (d) proficiency in reading, speaking, and writing in English.

Adolescents with and without ADHD were recruited through posters and ads in the community, including local newspapers, agencies, clinics, and community centers. Participants in the present study were part of a larger study being conducted at the Ontario Institute for Studies in Education of the University of Toronto (OISE/UT) by Dr. Rhonda Martinussen, examining listening, reading comprehension, and self-perceptions of adolescents with and without ADHD. A total of 109 participants initially consented to participate in the study. Of the initial 56 consenting participants with ADHD, nine participants were excluded for the following reasons: parent Conners data were not available (n = 2); they failed to meet criteria for exhibiting ongoing symptoms of ADHD (n = 2); parents were unclear about whether their child had a confirmed diagnosis (n = 3); they obtained IQ scores below the cut off T-score of 70 (n = 2). In the comparison group, 53 participants initially consented to the study; however, two were excluded because they demonstrated clinically significant levels of ADHD symptoms on the parent Conners. Thus, the remaining sample included 47 adolescents with ADHD and 51 comparison adolescents, for a total of 98 adolescents.

In the present study, participants were first examined categorically (ADHD versus comparison group) to address objective one, which focused on examining group differences across the variables of interest (source of self-efficacy, SESRL, and school engagement). Participants with ADHD were treated as one diagnostic group, rather than examining differences among symptom presentations (e.g., primarily inattentive versus
primarily hyperactive/impulsive). This decision was based on mounting evidence that ADHD symptoms exist along a continuum, and that symptom presentations are less distinct than previously thought and are likely to shift over time (Baeyens, Roeyers, & Walle, 2006; Hurtig, Ebeling, Taanila et al., 2007; Lubke, Hudziak, Derks, van Bijsterveldt, & Boomsma, 2009; Willcutt et al., 2012). To address the second objective of this study, which examined the relations among the sources, SESRL, and school engagement, the ADHD and comparison adolescents were combined into one group and ADHD symptoms were examined dimensionally. Thus, adolescents who failed to meet criteria for inclusion in the ADHD or comparison group due to their scores on the Conners 3-P ($n = 4$) were added back into the sample to create a larger group of 105 participants (53 males, 52 females).

The age at which the adolescents with ADHD were first diagnosed ranged from 4 to 15 years, with a mean age of 9 years, 1 month. Of the adolescents with ADHD, 75% were taking psychostimulant medication for their symptoms (e.g., Ritalin, Concerta). Because participants were completing a broad range of measures in a larger study, some of which are known to be sensitive to medication, adolescents with ADHD were asked to refrain from taking their medication on the testing day. Demographic information for each of the ADHD and comparison groups as well as the full sample is provided in Table 1. Results of the chi-square analyses indicated that adolescents with and without ADHD did not differ significantly from each other on parent marital status or parent education levels. However, significantly more adolescents with ADHD in this study were born in Canada in comparison to the adolescents without ADHD. The ADHD and comparison groups also differed in the number of languages other than English spoken within the
Table 1

Sample Characteristics of the ADHD Group, Comparison Group, and the Full Sample

<table>
<thead>
<tr>
<th>Sample Characteristic</th>
<th>ADHD (n = 47)</th>
<th>Comparison (n = 51)</th>
<th>Full Sample (n = 105)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% (n)</td>
<td>% (n)</td>
<td>X²(df)</td>
</tr>
<tr>
<td>Parent marital status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>68(32)</td>
<td>55(28)</td>
<td>4.15(5)</td>
</tr>
<tr>
<td>Common Law</td>
<td>2(1)</td>
<td>2(1)</td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>13(6)</td>
<td>18(9)</td>
<td></td>
</tr>
<tr>
<td>Separated or divorced</td>
<td>13(6)</td>
<td>18(9)</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>4(2)</td>
<td>0(0)</td>
<td></td>
</tr>
<tr>
<td>Highest level of parent education*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school degree</td>
<td>4(2)</td>
<td>12(6)</td>
<td></td>
</tr>
<tr>
<td>High school</td>
<td>30(14)</td>
<td>20(10)</td>
<td></td>
</tr>
<tr>
<td>College or university</td>
<td>47(22)</td>
<td>37(19)</td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>6(3)</td>
<td>20(10)</td>
<td></td>
</tr>
<tr>
<td>Post graduate</td>
<td>0(0)</td>
<td>0(0)</td>
<td></td>
</tr>
<tr>
<td>Born in Canada</td>
<td>92(43)</td>
<td>63(32)</td>
<td>7.98(1)**</td>
</tr>
<tr>
<td>Second language spoken at home</td>
<td>21(10)</td>
<td>49(25)</td>
<td>10.24(1)**</td>
</tr>
<tr>
<td>Current grade level</td>
<td></td>
<td></td>
<td>1.74(4)</td>
</tr>
<tr>
<td>Grade 8</td>
<td>4(2)</td>
<td>6(3)</td>
<td></td>
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<tr>
<td>Grade</td>
<td>36(17)</td>
<td>39(20)</td>
<td>36(38)</td>
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<td>-------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Grade 10</td>
<td>32(15)</td>
<td>35(18)</td>
<td>35(37)</td>
</tr>
<tr>
<td>Grade 11</td>
<td>26(12)</td>
<td>20(10)</td>
<td>22(23)</td>
</tr>
<tr>
<td>Grade 12</td>
<td>2(1)</td>
<td>0(0)</td>
<td>1(1)</td>
</tr>
</tbody>
</table>

Low achievement<br>36(17) 16(8) 5.40(1)* 26(27)

IEP support 81(38) 4(2) 61.88(20)** 41(43)

Behaviour difficulties 75(35) 20(10) 29.64(1)** 47(49)

Academic impairmentd 89(42) 10(5) 62.03(1)** 50(52)

Social impairmentd 64(30) 4(2) 39.92(1)** 31(32)

Home impairmentd 68(32) 6(3) 41.22(1)** 36(38)

*Defined by the highest score across education ratings for parent 1 and parent 2; **Determined by a standard score of 85 or less on any of the reading, writing, and mathematics composites from the Woodcock Johnson Tests of Achievement—Third Edition; IEP = Individual Education Plan; 'Determined by a T score equal to or greater than 60 on the DSM-IV ODD and/or the DSM-IV CD subscales of the Conners 3-P; "Determined by a score of 2 or higher on the impairment questions from the Conners 3-P

*p < .05, **p < .01, ***p < .001
home. Specifically, fewer participants with ADHD spoke a language other than English relative to participants in the comparison group. There were no significant differences between the ADHD and comparison groups in their current grade level completed. However, as is typical with an ADHD sample, many of the adolescents were experiencing co-occurring difficulties. That is, adolescents with ADHD were significantly more likely to be classified as low achievers (i.e., standard score below 85 on each the reading, writing, and mathematics composites of the *Woodcock Johnson Test of Achievement—Third Edition*) and to be receiving some form of special education support through an Individual Education Plan (IEP) at the time of the study. Adolescents with ADHD were significantly more likely than those in the comparison group to display behaviour challenges, as determined by a score in the clinical or borderline range (T-score ≥ 60) on the DSM IV Oppositional Defiant Disorder and/or the DSM IV Conduct Disorders subscales of the parent Conners 3. In addition, a greater number of adolescents with ADHD demonstrated impairments in the academic, social, and home settings than their non-ADHD peers. This pattern of results was identical even when the analyses were stratified by gender.

**Measures**

**Demographic information.** Demographic and background information was obtained via a brief questionnaire given to the participants’ mother or father. The information collected included mothers’ and fathers’ highest level of education, parent marital status, language(s) spoken at home, and the participants’ country of birth. Parental education was chosen to represent social class because it has been identified in previous literature as one of the most stable components of a family’s social status (Featherman, Spenner, &
Tsunematsu, 1988). Thus, the highest level of education obtained by each parent was averaged as a broad indicator of socioeconomic status (SES).

**Wechsler Abbreviated Scale of Intelligence (WASI; Wechsler, 1999).** The WASI is a standardized abbreviated measure of intellectual functioning that consists of four subtests: Block Design, Similarities, Vocabulary, and Matrix Reasoning. It can be administered in a four- or two-subtest form. In the current study, the two-subtest version was used (Vocabulary and Matrix Reasoning) to yield a Full-Scale IQ score, which is represented as a T-score with a mean of 100 and a standard deviation of 15. The WASI has been found to correlate highly with the Wechsler Intelligence Scale for Children (r = .83 to .89), a widely used measure of intelligence (Wechsler, 1999). There is also evidence for high reliability as well as good concurrent and construct validity (Sattler, 2001; Wechsler, 2003).

**Woodcock Johnson Test of Achievement—Third Edition (WJ-III; Mather & Woodcock, 2001).** Academic achievement was estimated using selected subtests from the WJ-III, which is a widely-used, norm-referenced test of achievement. The WJ-III includes 22 achievement subtests organized into reading, math, written language, and oral language clusters. Each achievement subtest and cluster yields a standard score with a mean of 100 and a standard deviation of 15 (Mather & Woodcock, 2001). In the current study, estimates of reading achievement were obtained by averaging a participant’s score across the Letter-Word Identification, Word Attack, and Passage Comprehension subtests. Written expression was estimated using the Writing Samples subtest, and mathematics achievement was estimated using an average score across the Calculation and Math Fluency subtests. An overall achievement score was calculated for each
participant by obtaining his/her average score across each of the aforementioned subtests. The percentage of adolescents with and without ADHD who obtained a standard score below 85 (< 16th percentile) on each of the academic areas (reading, writing, and math) was also calculated to provide descriptive data regarding the number of participants who could be categorized as low achievers.

The WJ-III has good evidence for internal consistency with subtest correlations exceeding .80 and .90 for the clusters (Mather & Woodcock, 2001).

*Conners Rating Scales-Third Edition* (*Conners 3; Conners, 2008*). The Conners 3 ratings scales were used to measure ongoing symptoms of ADHD. This measure is widely used for the clinical assessment of ADHD in children and adolescents. In the current study, parents of adolescents with and without ADHD completed the parent version of the Conners (Conners 3-P) to screen for participation in the study. Adolescents were administered a parallel self-report version (Conners 3-SR) as a measure of their perceptions of their ADHD symptoms. The parent- and self-report scales consist of 110 and 99 items, respectively. The 11 subscales of the parent version and the nine subscales of the self-report version are designed to measure various symptoms and behaviours associated with ADHD, including inattention, hyperactivity/impulsivity, learning problems, EF, peer and family relations, aggression, conduct disturbances, and oppositional behaviour. Ratings of ADHD symptoms and associated behaviours are provided on a 4-point Likert-type scale: 0 (not true at all), 1 (just a little true), 2 (pretty much true), and 3 (very much true). For each of the subscales, a T-score is derived with higher T-scores suggesting more problematic functioning. Internal consistency of
the Conners is high (coefficient alphas range from .79 to .96 across subscales; Conners, Sitarenios, Parker, & Epstein, 1998).

**The Sources of Self-Efficacy Scale (Usher & Pajares, 2006).** Originally adapted from Lent et al. (1991), the Sources of Academic Self-Efficacy Scale was modified by Usher and Pajares (2006) in order to investigate sources of academic and self-regulatory efficacy beliefs of entering middle school students. The Sources of Self-Efficacy Scale consists of 24 items designed to measure the four theorized sources of self-efficacy based on Bandura’s model. Six items assessed mastery experiences (e.g., “I get good grades in school”), 6 assessed vicarious experiences (e.g., “People I admire are good at academic work”), 5 assessed verbal persuasion (e.g., “My friends tell me that I am a good student”), and 7 assessed physiological/affective factors (e.g., “I’m nervous about doing school work”). Participants provided their responses on a 6-point Likert-type scale, from which 4 subscale scores and a total score can be derived. In the present study, Cronbach’s alpha coefficients were .84 for mastery experiences, .66 for vicarious learning, .88 for social persuasion, and .85 for physiological arousal. Cronbach’s alpha reliability for the total score was .90. Because this study linked self-efficacy and its sources to a general, non-domain-specific measure of school engagement, we did not specify a domain for the sources of self-efficacy scale, despite the enhanced predictive validity found in subject-specific measures (Bandura, 1994; Schunk & Pajares, 2009).

**Self-Efficacy for Learning Form (SELF; Zimmerman & Kitsantas, 2005).** The SELF is a 57-item measure that assesses students’ beliefs about their ability to use specific self-regulatory processes to cope with difficult learning conditions that involve reading, note-taking, test-taking, writing, and studying. Items on this scale include questions such as
“When you don’t understand a paragraph you have just read, can you clarify it by carefully rereading?” and “When you feel very anxious before taking a test, can you remember all the material you studied?” Students rate items such as these on a scale that ranges from 0 to 100 in 10-unit increments. Written descriptors are provided alongside the following data points: 0 (definitely cannot do it), 30 (probably cannot do it), 50 (maybe), 70 (probably can), and 100 (definitely can do it). Higher scores on the SELF reflect more positive SESRL beliefs.

For the purposes of the current study, adaptations were made to the SELF so that it was presented on computer rather than the traditional paper and pencil format. Each item appeared individually on the computer screen with the 0 to 100 scale (in increments of 10) and the corresponding descriptions. To reduce any differences based on individual reading levels, items were also read aloud to students through the computer. Once the item was read, students were asked to enter their response using the numbers on the keyboard in a response box that appeared on the screen.

In the current study, Cronbach’s alpha reliability for the SELF was .97. Zimmerman and Kitsantas (2005) reported a reliability of .99. In addition, they reported a correlation between the SELF and teacher ratings of students’ actual self-regulatory behaviour of .72, providing evidence for this measure’s strong predictive validity. Zimmerman and Kitsantas (2005, 2007) also found that scores on the SELF reflect a single underlying self-regulatory factor. Unlike previous measures of SESRL (i.e., Bandura, 1989; Schunk, 1996), the predictive validity of the SELF is optimized because the items extend beyond students’ beliefs about their procedural knowledge and skill
(e.g., setting goals, monitoring progress) to include their self-perceptions of confidence regarding their ability to cope with particular academic problems and contexts.

**School Engagement Questionnaire.** Participants completed an adaptation of a measure reported by Archambault, Janosz, Fallu, and Pagani (2009) to evaluate their levels of engagement at school. Although the original measure was designed to assess the three theoretical components of engagement (cognitive, behavioural, and affective), only items from the behaviour and affective subscales were of interest in the present study. Items assessing the cognitive aspect of engagement were not used because it was believed that they would correlate highly with measures of attention. In addition, items were used from the Programme for International Student Assessment (PISA; Organisation for Economic Co-operation and Development, 2009) to further support the measurement of behavioural and affective engagement. On the adapted School Engagement Questionnaire, 9 items were used to assess behavioural engagement. On 6 of these 9 items, participants were asked to rate their attendance, compliance, and involvement with school teams on a 4-point Likert-type scale from ‘never’ to ‘always.’ Sample items include, “How often have you skipped class without a valid reason?” and “How often have you disrupted your class on purpose?” Three of the 9 items asked participants to rate how much time they spent on various academic activities on a 4-point Likert-type scale from ‘no time’ to ‘3 hours or more.’ Seven items were used to assess affective engagement, which queried participant’s enjoyment of school and their level of interest with school-related challenges and activities. Sample items from this scale include, “I like school” and “What we learn in school is interesting.” Participants rated these items 4-point Likert-type scale that ranged from ‘never’ to ‘always.’ An overall score of school engagement was created
by averaging the responses to the total 16 items. After considering reverse-scored items, higher scored were taken to reflect higher levels of school engagement.

In the current study, Cronbach’s alpha reliability for the school engagement measure was .79. In addition, an exploratory factor analysis was completed, and results indicated that scores on the School Engagement measure reflect a single underlying factor.

**Procedure**

The testing sessions were conducted in a laboratory at the Ontario Institute for Studies in Education of the University of Toronto. Parents of the adolescents who were interested in participating were given a brief intake screen and asked to complete the Conners 3-P over the telephone to determine whether their child met the inclusion criteria. Those families who were eligible to participate were scheduled for an assessment session and were mailed consent forms. When participants arrived at the lab, consent forms were collected and adolescents were given a verbal overview of the procedure by the research assistant. Adolescents worked individually with a research assistant for approximately 4 to 5 hours, during which they completed a battery of self-report measures and standardized tests that were included as part of a larger study being conducted by Dr. Rhonda Martinussen. Measures that were relevant to the present study were located approximately one third of the way through the testing battery. Adolescents were provided with a break halfway through the session, and they were also encouraged to take small breaks in between tasks when needed. Research assistants were graduate students in school and clinical child psychology who were well-trained in psychological test administration. As an incentive for their participation in the study, all parents and
adolescents received an educational report describing their child’s functioning on relevant cognitive and academic measures. In addition to the report, adolescents were given the choice of receiving $30.00 cash or community service hours (necessary to receive a high school diploma in Ontario) to compensate for their time and travel expenses.

**Data Analysis**

The first objective of this study was to determine whether male and female adolescents with and without ADHD differ in the sources of self-efficacy, SESRL, and school engagement. Prior to addressing this objective, the univariate analyses of variance (ANOVAs) with group status (ADHD, comparison) and gender as the between-subject factors were analyzed to examine whether there were ADHD and/or gender differences on the demographic, behavioural, cognitive, and academic achievement measures. Each of the continuous variables was examined for normality. Except for the WASI Nonverbal IQ score, all other variables were normally distributed within each subgroup and across the full sample. The analyses were nonetheless conducted on the WASI Nonverbal IQ, as the $F$-test is considered robust to normality violations (see Lindman, 1974 for a summary). Chi-square analyses were used to examine ADHD group differences on the categorical variables (e.g., marital status, parent employment status). Six two (ADHD, comparison) by two (male, female) ANOVAs were then conducted to examine group and gender differences across the dependent variables. These included the total score from the SELF, the total score from the School Engagement Questionnaire, and the four subscale scores from the Sources of Self-Efficacy Scale (Mastery Experiences, Vicarious Experiences, Social Persuasion, and Physiological Responses).
The second objective of this study was to examine the relations among parent-rated inattention, the sources of self-efficacy, SESRL, and school engagement in a sample of 14 to 16 year-old adolescents. Based on Bandura’s theory and the existing literature, a hypothesized model of the relationship among the variables was established and the data were subjected to structural equation modeling (SEM) using *Mplus 7.0* (Muthén & Muthén, 2009). All variables were normally distributed in the full sample. Unlike other multivariate statistical procedures, SEM is beneficial because of its ability to deconstruct structural relations into direct, indirect, and total effects. It also requires strong theoretical underpinnings and empirical evidence, rather than being exploratory in nature. The testing of an a priori model may involve a comparison with another alternative or a posteriori model. Acceptance of a final model can be made with an evaluation of various goodness-of-fit index values, such as the chi-square statistics, the Bentler comparative fit index (CFI; Bentler, 1990), the Steiger-Lind root mean square error of approximation (RMSEA; Steiger, 1990) with its 90% confidence interval (CI), and the standardized root mean square residual (SRMR). In the present study, adequate fit was suggested by $\text{CFI} > 0.90$, $\text{RMSEA} < 0.05$ with its 90% CI, and $\text{SRMR} < .08$ (Hu & Bentler, 1999; Kline, 2011; MacCallum, Browne, & Sugawara, 1996). Once the full model was specified, the parameters estimates were interpreted.

The hypothesized model is depicted in Figure 1. According to the model, school engagement is hypothesized to show direct effects from SESRL beliefs, which in turn, is directly affected by the sources of self-efficacy. Parent-rated inattention would be indirectly related to school engagement through the sources of self-efficacy and SESRL. Preliminary analyses were first conducted to explore the bivariate correlations among the
variables and determine which, if any, of the control variables (i.e., age, SES, Full Scale IQ, and achievement), were relevant to include in the subsequent analyses. Control variables that were significantly associated with school engagement were subjected to a subsequent regression analysis to determine their predictive power relative to inattention, the sources, and SESRL.

Prior to testing the fit of the structural model, it was necessary to establish the measurement model. The measurement model determines the connection between the constructs in the model and the underlying data that define them (Kline, 2011). Individuals who did not have complete data at all time points (i.e., missing data) were still included in analyses, as Mplus uses a Full Information Maximum Likelihood (FIML) estimation of the mean, variance, and covariance parameters. FIML is a helpful technique which addresses missingness and provides unbiased and efficient estimates, assuming the data are missing at random and conditional on all of the observable data (Enders & Bandalos, 2001; Raudenbush & Bryk, 2002). Further explorations of the data revealed that the multivariate normality assumption was violated. Consequently, in contrast to ML estimation procedure that is based on multivariate normal distribution, Restricted ML (RML) estimation methods were used instead. The Sobel Test was used to test for mediation (Geiser, 2010); that is, to determine whether the sources of self-efficacy and SESRL mediated the relationship between parent-rated inattention and engagement.
CHAPTER 4

RESULTS

Research Objective 1: Do male and female adolescents with and without ADHD differ in the sources of self-efficacy, SESRL beliefs, and school engagement?

Table 2 presents means, standard deviations, and $F$ values for additional sample characteristics. The results of these preliminary univariate ANOVAs revealed that there were no significant group, gender, or interaction (group by gender) effects for age or SES. However, there was an effect of group status on estimated Verbal IQ and Full Scale IQ, with adolescents in the ADHD group scoring significantly lower than adolescents in the comparison group. There were no significant gender or interaction effects for these variables, nor were there significant group, gender, or interaction effects for Nonverbal IQ. In terms of academic achievement, there was a significant main effect of group status for the mathematics, writing, and overall achievement scores. That is, adolescents with ADHD scored significantly lower than their typically developing peers on overall academic achievement and achievement in the core academic areas of mathematics and written expression. The main effect for gender and the group by gender interactions were not significant for these variables. With respect to reading achievement, the effect of group status was not significant, nor was the interaction effect; however, there was a significant main effect for gender, with males scoring significantly lower on this composite measure than females.

ANOVAs were conducted on the parent- and self-report versions of the Conners 3, with Learning Problems, DSM-IV ADHD Inattentive, and DSM-IV ADHD Hyperactive-Impulsive subscales as the dependent variables. Significant group
Table 2

Sample Characteristics of Male and Female Adolescents in the ADHD and Comparison Groups

<table>
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<th>ADHD</th>
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<th>ANOVA Results</th>
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<td>4.79 (1.94)*</td>
<td>50.42 (6.58)</td>
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<td>50.88 (6.24)</td>
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<td>59.89 (12.01)</td>
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<td>50.50 (9.05)</td>
<td>60.37 (10.07)</td>
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<tr>
<td></td>
<td>50.32 (9.70)</td>
<td>50.32 (9.70)</td>
<td>62.38 (11.22)</td>
</tr>
<tr>
<td></td>
<td>50.43 (9.20)</td>
<td>50.43 (9.20)</td>
<td>54.53 (7.66)</td>
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<td>23.19 (1.94)***</td>
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<td>66.94 (15.21)</td>
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<td>SR Hyperactive-Impulsive</td>
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<td></td>
<td>64.45 (13.81)</td>
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<td>66.94 (15.21)</td>
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<td>53.11 (9.26)</td>
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<td>52.59 (9.41)</td>
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<td>24.79 (1.94)***</td>
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</tr>
<tr>
<td></td>
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<td></td>
<td>.92 (1.94)</td>
</tr>
</tbody>
</table>


*p < .05, **p < .01, ***p < .001
differences emerged across both versions on ratings of learning problems, inattention, and hyperactivity/impulsivity. As expected, parent- and self-reported learning challenges and symptoms of inattention and hyperactivity-impulsivity were significantly higher in the ADHD group than in the comparison group\(^2\). There were no gender differences in parent- or self-reported learning problems or symptoms of inattention or hyperactivity-impulsivity, nor were there significant interaction effects.

Although there were several group differences that emerged from the preliminary ANOVAs (i.e., IQ, achievement, parent- and self-reported learning problems, inattention, and hyperactivity-impulsivity), these variables were not considered as potential covariates because they reflect relationships that are highly associated with ADHD. One of the assumptions of analysis of covariance (ANCOVA) is that the covariates must be statistically independent from the grouping variable (Miller & Chapman, 2001). Therefore, a series of two (ADHD, comparison) by two (female, male) ANOVAs were performed to evaluate group and gender differences across the four sources of self-efficacy (mastery experiences, vicarious experiences, verbal encouragement, physiological responses), SESRL, and school engagement (see Table 3).

With respect to the sources of self-efficacy, there was a significant main effect of group status on mastery experience and social persuasion, with moderate effect sizes (partial $\eta^2 = .08$ for both mastery and social persuasion). Specifically, participants in the ADHD group perceived themselves to have fewer mastery experiences and less positive encouragement from others relative to adolescents in the comparison group. The group effects for vicarious experiences and physiological arousal were not significant.

\(^2\) These findings were noted in Chan & Martinussen (2015), which examined the positive illusory bias (PIB) in adolescents with ADHD using the same sample as the present study.
Table 3

*Group Differences in the Sources of Self-Efficacy, SESRL, and Student Engagement*

<table>
<thead>
<tr>
<th></th>
<th>ADHD</th>
<th>Comparison</th>
<th>ANOVA Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Females (n = 17)</td>
<td>Males (n = 30)</td>
<td>Total (n = 47)</td>
</tr>
<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
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<tr>
<td>Mastery</td>
<td>3.74(.85)</td>
<td>3.11(.82)</td>
<td>3.35(.88)</td>
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<tr>
<td>Vicarious</td>
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<td>3.41(.84)</td>
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<td>Social Persuasion</td>
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<td>Physiological</td>
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<td>3.04(.94)</td>
<td>2.96(1.03)</td>
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<tr>
<td>SELF</td>
<td>57.59(18.19)</td>
<td>58.63(16.27)</td>
<td>58.25(16.80)</td>
</tr>
<tr>
<td>Engagement</td>
<td>1.84(.42)</td>
<td>1.63(.41)</td>
<td>1.71(.42)</td>
</tr>
</tbody>
</table>

SELF = Self-Efficacy for Learning Form

*p < .05, **p < .01, ***p < .001*
As seen in Table 3, there was a significant effect of gender status on mastery experiences (partial $\eta^2 = .06$), vicarious experiences (partial $\eta^2 = .06$), and social persuasion (partial $\eta^2 = .06$), with the effect sizes being in the moderate range. Specifically, males obtained lower scores than females across all three measures. There were no significant interaction effects across any of the four sources of self-efficacy. Despite the lack of significant interaction effects, an inspection of the means suggests that males with ADHD were at a particular disadvantage for mastery experiences as their score was the lowest of the four groups.

In terms of SESRL beliefs, there was a significant main effect of group status (partial $\eta^2 = .15$, indicating a large effect size), with participants in the ADHD group rating their self-efficacy beliefs significantly lower than comparison adolescents. Specifically, adolescents with ADHD provided ratings that corresponded with the “maybe-probably can” range on the SELF, whereas the comparison group provided ratings that fell closer to the “probably can” value. In other words, adolescents with ADHD felt less competent in dealing with challenging learning situations related to reading, writing, note-taking, studying, and test-taking compared to their non-ADHD peers (see Table 3). The main effect for gender status and the interaction effect were not statistically significant. However, the non-significant interaction effect may be a result of limited power due to the small sample size in some cells (e.g., $n = 17$ females with ADHD; $n = 19$ males without ADHD). Lastly, a supplemental two (ADHD, comparison) by two (female, male) ANOVA was performed to evaluate group and gender differences in SESRL after excluding adolescents who were categorized as low achievers. The pattern of results was identical (partial $\eta^2 = .12$), indicating that low achievement status
did not account for the observed differences in SESRL between adolescents with and without ADHD.

As illustrated in Table 3, a two (ADHD, comparison) by two (female, male) ANOVA with student engagement as the dependent variable revealed a significant main effect of group status (partial $\eta^2 = .06$, indicating a moderate effect size), with participants in the ADHD group rating themselves as significantly less engaged at school than adolescents in the comparison group. That is, adolescents with ADHD perceived themselves as being less interested and involved in school, and as spending less time on school-related activities than their non-ADHD peers. However, an inspection of the means shows that the group with the lowest ratings of engagement was that comprised of males with ADHD.

Research Objective 2: How do inattention, the sources of self-efficacy, SESRL, and school engagement relate?

Preliminary Analyses

Bivariate correlations among the variables of interest (predictors, mediators, and outcome), as well as potential covariates (e.g., age, SES, cognitive abilities, achievement) were examined first (see Table 4). Parent-rated inattention was significantly negatively associated with school engagement, the sources of self-efficacy, and SESRL beliefs. Thus, adolescents with higher levels of attention difficulties were more likely to rate themselves as being less engaged at school, less confident in their ability to self-regulate their learning, and less likely to have access to the four sources of self-efficacy. In addition, the sources total score was significantly positively correlated with SESRL and school engagement, such that higher ratings on the sources total score were related to
more positive self-efficacy beliefs and higher levels of engagement. Self-efficacy for self-regulated learning beliefs were also positively correlated with school engagement. Thus, adolescents who felt more confident in their self-regulated learning abilities also rated themselves as being more engaged at school. Full scale IQ scores and overall achievement were related to the variable of interest (i.e., school engagement) in the expected direction, suggesting that it was important to consider their influence further.

This was achieved by conducting a hierarchical regression analysis predicting school engagement, with the control variables in the first step (i.e., WASI Full Scale IQ and WJ-III Overall Achievement scores) and the theoretically relevant predictor variables in the second step (i.e., parent-rated inattention, total scores from the SELF and Sources scales). Results indicated that only achievement predicted a significant proportion of the variance in school engagement ($R^2 = .112$, $F(2,81) = 5.00, p < .01, \beta = .423, p < .05$) before inattention, the sources, and SESRL were included in the model. When these variables were added in the second step, additional variance was predicted ($\Delta R^2 = .491$, $F(5,81) = 23.09, p < .001$) and overall achievement was no longer a significant predictor ($\beta = .105, p = .419$). In this final step, only the sources and SESRL were unique predictors of school engagement ($\beta = .573, p < .001$ and $\beta = .229, p < .05$). This pattern of results suggests that IQ and achievement do not share a unique relationship with school engagement; rather, they share variance with inattention symptoms, the sources of self-efficacy beliefs, and with SESRL, which are, in turn, unique predictors of student engagement (see Table 4). Given the sample size, the decision was made to exclude overall achievement and full-scale IQ from the path analysis. In future studies, it would be important to examine
Table 4

_Bivariate Correlations among Relevant Sample Characteristics, Parent-Reported Inattention, the Sources of Self-Efficacy, SESRL, and Student Engagement in the Full Sample_

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<th>5</th>
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<td>0.78**</td>
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<td>0.29**</td>
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<td>0.28*</td>
<td>0.32**</td>
<td>0.43**</td>
<td>-0.39**</td>
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<td>8. Engagement</td>
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<td>-0.34**</td>
<td>0.75**</td>
<td>0.63**</td>
<td>1.0</td>
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PR = Parent-Rated

*p < .05, **p < .01, ***p
whether achievement contributes to the development of SESRL beliefs or is an outcome of adolescents’ beliefs and levels of engagement.

Assessment of the Measurement Model

The Sources of Self-Efficacy Scale includes four factors (mastery experiences, vicarious learning, verbal persuasion, and physiological arousal). Confirmatory factors analysis was done to determine the adequacy of factor loadings and model fit of the Sources of Self-Efficacy Scale. All factors loadings for the latent source variable were statistically significant and in the expected direction (see Figure 2). As indicated by the following fit statistics, the four-factor model fit the data exceptionally well. Specifically, RMSEA = .00, 90% CI (.00, .15); CFI = 1.00; and SRMR = .01.

Assessment of the Structural Model

To evaluate the second objective of this study, the associations among parent-rated inattention, the sources of self-efficacy, SESRL, and school engagement were examined by the structural equation model (see Figure 1). In this model, Source is a latent variable specified by four factors: mastery experiences, vicarious learning, verbal persuasion, and physiological arousal. Inattention was specified by parent ratings on the DSM-IV ADHD-Inattentive subscale of the Conners 3; SESRL was specified by the total SELF score; school engagement was specified by the total score on the School Engagement Questionnaire.

The results indicated that the model fit was adequate [RMSEA = 0.12\(^3\), 90% CI (.05, .16); CFI = .93; SRMR = .06]. The structural parameter estimates are presented in

\(^3\) The RMSEA value exceeded the cut-off of .05; however, that this cut-off value was within the 90% CI was considered (Kenny, 2015). A model with fewer parameters was tested to examine the influence on the goodness-of-fit indices. See Supplemental Analyses.
Figure 2. Direct, indirect, and total effects are presented in Table 5. The following results were obtained: 1) the total effect from inattention to student engagement was significant; 2) the direct effect of inattention on student engagement was not significant; 3) the indirect relationship from inattention to student engagement via SESRL was not significant; 4) there was a significant indirect relationship from inattention to student engagement via the sources of self-efficacy; 5) inattention was indirectly related to school engagement through both the sources of self-efficacy and SESRL. An examination of the total, direct, and indirect effects provides evidence for mediation (see Table 5). That is, the sources of self-efficacy and SESRL mediated the relationship between inattention and student engagement.
Figure 2

Structural Model Depicting the Relations among Parent-Rated Inattention, the Sources of Self-Efficacy, SESRL, and Student Engagement

Mastery
Vicarious
Persuasion
Emotional
Table 5

*Standardized Direct, Indirect, and Total Effects from Parent-Rated Inattention to Student Engagement*

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<th></th>
<th>Estimate</th>
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<td>Direct</td>
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<td>.51</td>
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<td>.00</td>
</tr>
<tr>
<td>PR Inattention, sources, SESRL, engagement</td>
<td>-.07</td>
<td>-2.82</td>
<td>.01</td>
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</table>

SESRL = Self-Efficacy for Self-Regulated Learning; PR = Parent-Rated
Supplemental Analyses

The RMSEA value for the structural model exceeded the cut-off of 0.05; however, this cut-off fell within the 90% confidence interval, which takes into account sampling error (Kenny, 2015). Of note, models with small df and low N (< 200), as with the present study, are known to have artificially large values of the RMSEA (Kenny, 2015). In fact, some researchers (e.g., Kenny, Kaniskan, & McCoach, 2014) have argued that the RMSEA value not be computed for low df and low N models. To determine whether the RMSEA value may have been inflated due to the small sample size and relatively large number of parameters in the model, a supplemental analysis of the structural model was completed without the inclusion of the four factors (mastery experiences, vicarious learning, verbal persuasion, and physiological arousal) comprising the latent Sources variable. Thus, rather than treating the Sources as a latent variable, the composite (total) score from the Sources of Self-Efficacy Scale in the supplemental structural equation model was used. Results indicated that the RMSEA value was improved [RMSEA = .00, 90% CI (.00, .00)], as were the other fit statistics (CFI = 1.00, and SRMR = .00). This improvement in model fit with fewer factors suggests that the small sample size and large number of parameters in the first structural model may have contributed to inflated fit statistics.
CHAPTER 5
DISCUSSION

The overall objective of this dissertation was to advance our understanding of motivation in adolescents with ADHD by examining key motivational constructs including self-efficacy beliefs, the sources of self-efficacy, and student engagement, as well as how these variables relate to each other and to symptoms of inattention. Although different theoretical models explain student motivation, the present study utilized Bandura’s (1986, 1997, 2001) social cognitive theory of psychological functioning, which emphasizes that self-efficacy beliefs are a driving force behind student behaviour, including their interest and engagement at school (Bandura, 1986, 1997; Schunk & Mullen, 2012). Bandura (1997, 2000) also identified four sources of self-efficacy through which individuals interpret and draw from to form their self-efficacy beliefs: previous experiences of success, exposure to and identification with efficacious models, verbal encouragement and support from others, and emotional reactions in the context of task performance. Thus, self-efficacy beliefs play a mediating role between the sources of self-efficacy and student engagement. Although researchers have examined Bandura’s model in typically developing adolescents and adolescents with LDs, very little is known about the sources of self-efficacy, SESRL, and student engagement in adolescents with ADHD or how symptoms of inattention may influence these key motivational variables. Thus, this dissertation aimed to (1) determine whether male and female adolescents with and without ADHD differ in terms of the sources of self-efficacy, SESRL, and their levels of engagement at school, and (2) examine the relations among inattention, the sources of self-efficacy, SESRL, and student engagement. This chapter will provide a
discussion of the study results, practical implications, limitations, and directions for future research.

**Group Differences in the Sources, SESRL, and Engagement**

The first objective of this study was to determine whether male and female adolescents with and without ADHD differ in terms of the sources of self-efficacy, SESRL, and student engagement. With respect to group differences in SESRL beliefs, results indicated that adolescents in the ADHD group rated their SESRL beliefs significantly lower than comparison adolescents, and the degree of this effect was large. Specifically, adolescents with ADHD provided ratings that corresponded with the “maybe-probably can” range (58% confident) on the SELF, whereas ratings of the comparison group fell closer to the “probably can” value (70% confident). In other words, compared to their non-ADHD peers, adolescents with ADHD felt less confident in their ability to use self-regulation strategies to overcome challenging learning tasks related to reading, writing, note-taking, studying, and test-taking. These results are consistent with the study hypotheses as well as previous research examining self-efficacy in community and clinical samples of participants with ADHD (Luzzo et al., 1999; Major et al., 2013; Norvilitis et al., 2010; Norwalk et al., 2009; Tabassam & Grainger, 2002; Tomevi, 2013; Young et al., 2005). These results also fit well with recent qualitative research (Wiener & Daniels, 2015) in which adolescents with ADHD identified themselves as having challenges with self-regulation and personal agency. Relative to their peers, it appears that adolescents with ADHD are less sure of their ability to successfully manage the self-regulatory demands of secondary school. As there is a substantial amount of empirical evidence for deficits in EFs and self-regulation in
individuals with ADHD (e.g., Barkley et al., 2001; Nigg et al, 1998; Toplak et al., 2009; Valera et al., 2007; Willcutt et al., 2010; Willcutt et al., 2005), this finding provides a unique contribution to the literature by shedding light on adolescents’ beliefs regarding their ability to self-regulate their learning effectively. This is important given evidence that student beliefs and expectations can powerfully influence academic outcomes, at times, beyond existing knowledge and skill (e.g., Zuffianò et al., 2013).

This study failed to find a gender difference in SESRL beliefs nor a significant interaction between gender and ADHD. That is, both males and females in the present study provided similar ratings of confidence in their ability to self-regulate their learning—a finding that is inconsistent with the existing literature. For instance, in typically developing children and adolescents, females tend to rate themselves higher on measures of SESRL relative to males (e.g., Pajares, 2002; Pajares & Valiante, 2001; Vecchio et al., 2007). Conversely, in a clinical sample, Major and colleagues (2013) found that female adolescents with ADHD provided the lowest ratings of SESRL relative to female adolescents without ADHD and male adolescents with and without ADHD. Of note, this latter study was limited by a small sample of female adolescents with ADHD \( (n=13) \), which may have led to spurious results (Major et al., 2013). Unfortunately, the present study is also limited by a small sample size of female adolescents with ADHD, making it difficult to provide clarification regarding potential gender differences in SESRL. There is a growing body of research that has demonstrated subtle but important vulnerabilities in the emotional functioning of females with ADHD (Nussbaum, 2012; Rucklidge, 2010; Rucklidge & Tannock, 2001), as they are at a higher risk for internalizing and psychosocial problems relative to their male counterparts (Rucklidge &
Tannock, 2001). Given this risk combined with the present study’s results regarding gender differences in SESRL, future research should continue to include gender in their analyses of the self-perceptions of adolescents with ADHD.

With respect to the sources of self-efficacy, the hypotheses were partially supported. As predicted, adolescents with and without ADHD differed significantly in their ratings of mastery experiences and verbal persuasion. Thus, like their peers with LDs (Hampton, 1998; Hampton & Mason, 2003; Usher & Pajares, 2006), adolescents with ADHD perceived themselves as having less success on academic tasks and receiving less positive encouragement from others. However, contrary to the study hypotheses and previous findings in the LD literature, there were no group differences in reported vicarious experiences or levels of physiological arousal. In other words, adolescents with ADHD and typically developing adolescents reported comparable levels of exposure to efficacious models and emotional responsivity on academic tasks.

The finding that adolescents with ADHD reported having less academic success than their non-ADHD peers is not surprising given that widespread academic impairments have been well-documented in ADHD (e.g., Barbaresi et al., 2007; Bauermeister et al., 2007; DuPaul & Stoner, 2014; Frazier et al., 2007; Lahey et al., 2004; Rogers et al., 2011). However, this finding adds to the literature showing that adolescents with ADHD are indeed aware of these difficulties. This is important for several reasons. Firstly, existing evidence suggests that children with ADHD tend to be positively biased in their judgments about their capabilities, particularly in the domain with which they experience the most difficulty (e.g., Hoza et al., 2002, 2004; Milich & Okazaki, 1991; Owens & Hoza, 2003). Although there is evidence to suggest that this positive illusory
bias (PIB) continues into adolescence (Hoza et al., 2010; McQuade, et al., 2011),
research has demonstrated that adolescents with ADHD do not lack complete awareness
of their challenges (Chan & Martinussen, 2015; Varma, 2013). In spite of the PIB in
ADHD, most studies comparing children with and without ADHD on academic self-
concept have found lower self-concept in children with ADHD (Owens et al., 2007). This
is consistent with the present findings demonstrating that adolescents with ADHD report
lower ratings of mastery experiences in adolescents with ADHD relative to comparison
adolescents. Secondly, being aware of one’s difficulties is considered an important
component of learning and self-enhancement (Milich & Okazaki, 1991). Therefore,
having an awareness of their challenges relating to mastering academic tasks may be a
starting point for adolescents with ADHD in accepting feedback from others, seeking
help when needed, and taking the appropriate steps towards building skills. However, the
opposite effect may also be true, and repeated failure may foster learned helplessness in
adolescents with ADHD, decreasing their motivation on similar tasks in the future.
Indeed, there is evidence to support this contention, as children with ADHD are more
likely than children without ADHD to demonstrate behaviours consistent with learned
helplessness when faced with repeated failure (Milich, 1994; Milich & Okazaki, 1991;
Firmin, Hwang, Copella, & Clark, 2004). Consistent with Bandura’s social cognitive
theory (1986, 1997), if adolescents with ADHD perceive themselves as having fewer
mastery experiences, it is feasible that this may impact their confidence levels on
academic tasks and how much effort and persistence they put forth.

In addition to reporting fewer mastery experiences, adolescents with ADHD also
perceived themselves as receiving less verbal encouragement about their abilities in the
classroom than typically developing adolescents. This finding fits well with existing evidence of a compromised teacher-student relationship in students with ADHD—one that is characterized by more negativity, a weaker emotional bond, and less collaboration (Arcia et al., 2000; Atkinson et al., 1997; Batzle et al., 2010; Greene et al., 2002; Murray & Zvoch, 2011; Ohan et al., 2011; Rogers et al., 2015; Taylor & Larson, 1998). Several possible factors may interfere with the teacher-student relationship and lead to reduced verbal persuasion toward adolescents with ADHD. For instance, teachers of students with ADHD report limited knowledge regarding the characteristics of the disorder (Arcia et al., 2000), lower confidence in teaching these students (Ohan et al., 2011; Taylor & Larson, 1998), and greater levels of effort and stress (Atkinson et al., 1997; Greene et al., 2002). Rogers and colleagues (2015) found that, by measuring ADHD symptoms rather than a clinical diagnosis of the disorder, barriers in the teacher-student bond were likely attributable to the core symptoms of ADHD, rather than the label itself. The influence of inattention on the sources of self-efficacy was explored as part of the second objective of this study, with results demonstrating that higher levels of inattention predicted lower scores on the sources of self-efficacy measure, including verbal encouragement. In addition, given weaker academic skills and reports of fewer mastery experiences in adolescents with ADHD, it may be that there are simply fewer opportunities for teachers, as well as parents and peers, to provide adolescents with ADHD with positive feedback about their performance. However, that adolescents with ADHD are not receiving comparable levels of encouragement as their peers raises additional concerns regarding what information parents and teachers are attending to and how success is defined in the classroom. That is, there may be fewer opportunities for encouragement if educators are
focusing on outcomes, such as grades, rather than identifying adolescents with ADHD’s unique strengths, small successes, and the effort they put forth in the process. Nevertheless, the present study suggests that adolescents with ADHD likely do not feel encouraged at school, and this is problematic given the importance of a positive and supportive classroom environment to learning, motivation, and achievement (Bandura, 1997; Hamre & Pianta, 2001; Rogers et al., 2015).

Contrary to expectations, adolescents with ADHD reported having exposure to as many efficacious models as their non-ADHD peers. This finding is inconsistent with previous research conducted with adolescents with LDs, who rate themselves as having fewer role models to identify with relative to typically developing adolescents (Hampton, 1998; Hampton & Mason, 2003). According to Bandura (1986, 1997), modelling, or vicarious learning, occurs when the observer and the model share similar qualities.

Because most adolescents with ADHD are educated in mainstream classrooms among their typically developing peers (e.g., Bussing et al., 2012; Hoagwood et al., 2000), it was presumed that they would have less exposure to other adolescents with ADHD who have similar characteristics and academic challenges. Even if adolescents with ADHD are among peers with ADHD whom they identify with, these adolescents may be less likely to model success relative to typically developing adolescents given that they may also have neurocognitive and functional impairments. Having positive peer and adult role models can have a bolstering effect on achievement (e.g., Bempechat, 1992; Brechwald & Prinstein, 2011; Murphey & Arao, 2001; Parsons et al., 1982), and this may be particularly true for individuals with ADHD (e.g., Carbone, 2001; Deault, 2010; Hurt, Hoza, & Pelhem, 2007). Therefore, the finding that adolescents with ADHD perceive
themselves as having positive role models for learning and achievement is a positive one, insofar as they interpret and utilize this information to drive the efforts they put forth in their learning. It is also easy to conceive, however, that being around others for whom academic success comes more readily can have a detrimental affect on one’s self-efficacy beliefs and motivation. Although it was not the focus of the present study to determine the unique impact of vicarious learning on SESRL beliefs, this is a question for future research.

Also contrary to expectations, adolescents with ADHD reported comparable levels of emotional responsivity on academic tasks as their non-ADHD peers. This finding is inconsistent with the LD literature, as adolescents with LDs report high levels of anxiety on source measures relative to typically developing youth (Hampton, 1998; Hampton & Mason, 2003). These results are also inconsistent with what would be expected given the high rates of internalizing difficulties in children and adolescents with ADHD, including depression, anxiety, and low self-esteem (see Barkley, 1998 for a discussion; Herman et al., 2007; MacPhee & Andrews, 2006), as well as their challenges with emotion regulation (Barkley & Fischer, 2010; Melnick & Hinshaw, 2000; Musser et al., 2011; Wehmeier et al., 2010). It is unclear as to why adolescents with ADHD are reporting comparable levels of anxiety on academic tasks as their non-ADHD peers given these emotional vulnerabilities. One theory is that adolescents with ADHD in the present study have lower rates of pre-existing internalizing difficulties than what is typically found in the population, making them less prone to experiencing anxiety in the context of academic task performance than adolescents with ADHD who have comorbid internalizing symptoms. Internalizing symptoms were not measured in the present study;
therefore, clarification regarding their influence on the sources of self-efficacy and, in particular, physiological arousal, may be an interesting line of inquiry for future research. It may also be that the comparable ratings of emotional reactivity in adolescents with and without ADHD reflect the supports that may be put in place for those with ADHD. That is, 81% of students with ADHD in the present study reported having access to special education support, which may take the form of accommodations (e.g., more time, access to the resource room) on tests and other high-stakes academic tasks. It is plausible that, with these supports, adolescents with ADHD may feel more at ease when completing demanding academic work, thereby buffering their emotional reactions. Alternatively, adolescents with ADHD may be less aware of their emotional responsivity when asked on a rating scale measure, whereas they may be more likely to report it in the moment when the feelings are more obvious to them.

Gender differences emerged on the sources measure. Specifically, female adolescents, regardless of whether or not they had ADHD, were more likely to perceive themselves as having higher rates of mastery and vicarious experiences, and more positive verbal encouragement from others relative to male adolescents. Males and females did not differ in terms of self-reported emotional reactivity. Previous research provides support for gender differences in the sources of self-efficacy. More specifically, researchers have consistently found that females report higher rates of verbal encouragement from others and more vicarious learning opportunities than males (Anderson & Betz, 2001; Butz & Usher, 2015; Lent et al., 1996; Usher & Pajares, 2006; Zeldin & Pajares, 2000), which was indeed observed in the present study. There is evidence to suggest that females tend to demonstrate more appropriate classroom
behaviour and are more self-regulated in their learning (Pajares, 2002; Pajares & Valiante, 2001; Vecchio et al., 2007; Zimmerman & Martinez-Pons, 1990). Thus, they may be more likely than males to receive positive feedback from their teachers and they may have more exposure to similar peers who model their efforts and successes in the classroom. It is also plausible that male and female adolescents do not objectively differ in their exposure to verbal encouragement and efficacious models, but that they perceive themselves to differ, suggesting that there may be gender differences regarding how males and females attend to and reflect upon various aspects of their environment. In line with this reasoning is evidence from previous research indicating that girls tend to notice social information more readily than boys, and they are more likely to draw on this information when forming their self-perceptions (Usher & Pajares, 2006; Zeldin & Pajares, 2000). Evidence for gender differences in self-judgments may account for differences between males and females in their self-reported mastery experiences. This is because male and female adolescents did not differ on standardized achievement tests in the present study—suggesting that their pre-existing academic skills are comparable—yet female adolescents reported having more mastery experiences than males. Of note, gender differences in mastery experiences have not been demonstrated in previous research (Pajares & Schunk, 2001; Usher & Pajares, 2008), suggesting that a replication of the present results are needed to draw firmer conclusions. Nonetheless, males seem to be at an overall disadvantage in their access to three of the four sources of self-efficacy. Despite this disadvantage, male adolescents did not report lower levels of SESRL beliefs, although given the small sample size, this may be an issue of statistical power. Males
may draw upon other sources of information not explored in the current study when forming their self-efficacy beliefs.

Lastly, adolescents with ADHD also rated their engagement at school as significantly lower than adolescents in the comparison group. That is, adolescents with ADHD reported less enjoyment and interest in school, being less engaged in the classroom, and less involved in school-based activities (e.g., school clubs, homework, class discussions) compared their non-ADHD peers. Although limited, previous research in clinical and community samples has linked inattention to lower levels of behavioural engagement (e.g., Demaray & Jenkins, 2011; Martin, 2012; Vile Junod et al., 2006), and the present results fit well with these findings. It is easy to speculate why adolescents with ADHD may have lower levels of student engagement. Challenges with aspects of behavioural engagement, including task initiation, persistence, and follow-through may be reflective of underlying neurocognitive impairments commonly associated with ADHD, namely deficits in EF and motivation. In addition, by virtue of demonstrating symptoms of inattention, one would expect adolescents with ADHD to be less engaged (i.e., more off-task) on academic tasks. However, given that the correlation between inattention and engagement in the present study was only modest (r = -.34), this suggests that the engagement measure is capturing more than just symptoms of inattention and off-task behaviour. Indeed, items on the School Engagement Questionnaire not only assess aspects of behavioural engagement (e.g., participation in class, work completion, following the rules, involvement in school clubs), but also aspects of affective engagement, including how much adolescents value learning, and their general interest and enjoyment of school. Studies have found that adolescents with ADHD are more
likely to report boredom, feeling less connected to their teachers, a negative attitude
towards school, and low levels enjoyment in learning relative to their peers (Carlson,
Booth et al. 2002; Castens & Overbey, 2009; DuPaul & Stoner, 2003; Pfiffner et al.,
1998; Rogers & Tannock, 2013). This low level of affective engagement is of particular
concern given the strong link between low student engagement and negative academic
outcomes, including lower grades and high school dropout (e.g., Archambault et al.,
2009; Bandura et al., 1996; Finn & Zimmer, 2012; Marks, 2000; Wang & Holcombe,
2010; Whitlock, 2006).

**Relations Among Inattention, the Sources, SESRL, and Engagement**

The second objective of this study was to explore the relations among inattention
symptom severity, the sources of self-efficacy, SESRL, and student engagement in the
full sample of adolescents with and without ADHD. This objective was achieved by
using structural equation modeling to test a hypothesized model based on Bandura’s self-
efficacy theory and research examining the relations among inattention symptoms and
self-efficacy beliefs (Luzzo et al., 1999; Major et al., 2013; Norvilitis et al., 2010;
Norwalk et al., 2009; Young et al., 2005). Of note, parent ratings of inattention were used
rather than self-reports to provide a more objective estimate of inattentive symptoms and
to reduce shared variance due to informant overlap between inattention and engagement.
Preliminary correlations revealed that adolescents with higher scores on the sources of
self-efficacy measure also had higher levels of SESRL beliefs, which in turn, were
related to higher levels of engagement. In addition, adolescents with higher levels of
parent-rated inattention perceived themselves to have less access to the sources of self-
efficacy, lower SESRL beliefs, and lower levels of engagement at school. Path analysis
revealed that the sources of self-efficacy and SESRL mediated the relationship between parent ratings of inattention and student engagement. The structural model fit the data reasonably well, accounting for 44% of the variance in engagement. Potential confounding variables, such as full-scale IQ and overall achievement were ruled out in a preliminary regression analysis as unique predictors of student engagement. In future studies, it would be helpful to examine how achievement contributes to and is a function of self-efficacy beliefs and the sources of self-efficacy. A longitudinal perspective would be most appropriate to best understand the developmental trajectory of SESRL beliefs from middle school to high school and their relationship with achievement.

Adolescents who reported more access to the sources of self-efficacy also reported higher levels of SESRL, which in turn, influenced student engagement. This finding supports the core tenants of Bandura’s social cognitive theory (1986, 1997), which states that self-efficacy beliefs play a mediating role between four key sources of information and academic outcomes such as student engagement. Much of the previous research examining Bandura’s social cognitive theory has examined the antecedents and outcomes of self-efficacy separately (e.g., Anderson & Betz, 2001; Caraway et al., 2003; Klassen, 2004; Lent et al., 1991; Lent et al., 1996; Linnenbrink & Pintrich, 2003; Lopez et al., 1997; Usher & Pajares, 2006). By including both antecedents (sources of self-efficacy) and outcomes (student engagement) in one study and employing structural equation modelling, the present study unites these two lines of inquiry and provides a closer approximation of Bandura’s theoretical model and the temporal relations among these variables. Thus, this study adds to a small but growing research base that has identified self-efficacy as a central mechanism between source variables and student
learning and achievement (Bong, 2001; Fenollar et al., 2007; Liem et al., 2008; Pajares, 1996; Pajares & Graham, 1999; Pajares & Miller, 1994; Pajares & Valiante, 1997; Phan, 2010; Prat-Sala & Redford, 2010; Sins et al., 2008). The connection between SESRL beliefs and higher levels of student engagement fits well with the existing literature describing the characteristics of self-efficacious learners. That is, students who feel more confident in their learning are likely to set challenging goals, monitor and evaluate their progress, focus their attention, put forth a consistent effort, and employ a range of learning strategies across academic domains (e.g., Bandura et al., 1996, 2001; Bandura et al., 2003; Bong, 2001; Linnenbrink & Pintrich, 2003; Schunk, 1995; Zimmerman et al., 1992). In other words, self-efficacious learners are also more engaged in the learning processes.

The present study provides an extension of Bandura’s social cognitive theory by examining the role of parent-rated inattention symptoms. This research also sheds light on the mechanisms through which behavioral inattention exerts its influence on engagement. That is, the direct relationship between inattention and student engagement was rendered non-significant once the influence of the sources of self-efficacy and SESRL were considered. Symptoms of inattention have been consistently identified as a risk factor for negative academic outcomes relative to symptoms of hyperactivity/impulsivity (Nigg et al., 2005; Todd et al., 2002). For example, researchers have found that students with higher levels of inattention score lower on cognitive and achievement tests, have worse grades, and have more frequent placement in special education compared to students with higher levels of hyperactivity (e.g., Todd et al., 2002). Researchers have also previously found a link between inattention and self-
efficacy beliefs (Luzzo et al., 1999; Major et al., 2013; Norvilitis et al., 2010; Norwalk et al., 2009; Young et al., 2005). Findings from the current study add to this literature by demonstrating that adolescents with attention problems also have less access to the sources of self-efficacy and feel less efficacious about their ability to overcome learning challenges, both of which influence their engagement and interest in school. A number of studies have demonstrated that the relationship between inattention and academic outcomes is indirect through important “academic enablers” such as attitudes, beliefs, and engagement (Demaray & Jenkins, 2011; DuPaul et al., 2004; Langberg et al., 2011; Plamondon & Martinussen, 2015; Volpe et al., 2006). For instance, Rapport and colleagues (1999) found that teacher-rated classroom performance, which included aspects of behavioural engagement, significantly mediated the relationship between inattention and academic achievement. Taken together, these results suggest that inattention is a cognitive risk factor for a host of challenges in the classroom, and that inattention may exert its influence on academic outcomes through multiple indirect pathways, one of which may involve the sources of self-efficacy and SESRL beliefs. The impact of cognitive vulnerabilities on the sources of self-efficacy, self-efficacy beliefs, and academic outcomes is also reflected in the LD literature. Hampton and Mason (2003) found that LD status had an indirect effect on academic outcomes (i.e., grades) through the four sources of self-efficacy and academic self-efficacy beliefs. These findings support the notion that cognitive impairments can impact the development of self-efficacy beliefs by limiting one’s access to the sources of self-efficacy. Furthermore, the relations among these variables are likely cyclical in nature. For instance, lower levels of engagement may both result from and contribute to less access to the sources and
SESRL, such that the less engaged students are in the classroom, the less likely they are to master tasks, elicit verbal encouragement, or identify with positive role models.

As evidenced from the present study, adolescents with attention difficulties have lower levels of SESRL due, in part, to less access to the sources of self-efficacy. Although not directly examined, it may be that underlying deficits in EF also contribute to the relationship between inattention and SESRL. There is indeed evidence linking inattention to deficits in EF, as adolescents with more attention problems may have particular difficulties with tasks such as goal setting, planning ahead, self-control, and focusing attention (e.g., Stavro et al., 2007; Wasserstein, 2005) than adolescents with lower levels of attention difficulties. In addition, the high school learning environment is far more demanding and less structured than in elementary school and students are expected to be more self-directed in their learning (Pajares & Urdan, 2006). Students who are more inattentive and have EF deficits may be particularly disadvantaged in managing these diverse requirements and may consequently feel less confident in their self-regulatory skills than students with inattention symptoms alone. Therefore, EF skills may co-vary with symptoms of inattention, both of which exert their influence on the sources of self-efficacy and subsequent SESRL beliefs.

Taken together, the above research findings make a novel contribution to our understanding of Bandura’s social cognitive theory and to the motivational dysfunction in ADHD. Motivation is a complex and multi-faceted construct that is comprised of cognitive (e.g., self-perceptions, beliefs), affective (e.g., interest), and behavioural (e.g., engagement, effort and persistence) components (Schunk et al., 2008; Schunk & Mullen, 2012). Both self-efficacy beliefs and student engagement are valuable motivational
variables to examine when exploring student behaviours that are linked to improved educational functioning (Archambault et al., 2009; Bandura et al., 1996; Greenwood, 1996; Pajares & Urdan, 2006; Pajares, 1996; Whitlock, 2006). Existing theories have attributed ADHD symptomatology and behaviours to an underlying motivational style (delay aversion) associated with fundamental alterations in reward mechanisms, including a motivation to escape or avoid delay (Sonuga-Barke, 1994, 1998, 2003; Swanson et al., 1998). Objectively, motivational impairments in children and adolescents with ADHD are reflected in their lower rates of persistence and effort on academic tasks, higher levels of frustration when faced with a challenge, and a greater preference for easy work compared to their non-ADHD peers (Barkley, 1997; Carlson et al., 2002; Hoza et al., 2001). The present study suggests that low self-efficacy beliefs may, in part, contribute to these objective deficits in motivation in ADHD. In typically developing children and adolescents, those who perceive themselves as confident in their abilities are indeed more likely to choose challenging tasks, put forth a consistent effort, effectively use self-regulation strategies, and modulate their emotional responses when faced with difficulty (Bandura, 1997; Bandura et al., 2001; Bandura et al., 1999; Muris, 2002; Pajares, 1996; Zimmerman, 2000). Furthermore, low motivation is more often associated with inattention than hyperactivity/impulsivity (Langberg et al., 2010; Power et al., 2006; Sasser et al., 2015). Therefore, by examining self-efficacy and engagement in adolescents with ADHD while also exploring how symptoms of inattention relate to the sources, SESRL, and engagement, this dissertation has expanded our knowledge of the factors that characterize low motivation in ADHD.
Limitations and Future Directions

Findings from the current study must be considered in light of several limitations. First, parent reports of a previous ADHD diagnosis with current levels of symptomatology confirmed via the use of ADHD parent ratings scales was used to identify the sample of youth with ADHD. Although previous psychological and/or psychiatric assessments were requested to confirm ADHD diagnoses, very few participants provided this information. In future studies, the validity of ADHD diagnoses can be improved by including a full ADHD diagnostic inventory as part of the recruitment process.

Second, the sources of self-efficacy were measured using youths’ self-reports on a Likert-type scale. Bandura (1997, 2000) argued in his self-efficacy theory that the sources are complex and multifaceted variables, suggesting that an in-depth understanding of each source of self-efficacy may require additional data sources (Phan, 2012). Unfortunately, most studies examining the sources of self-efficacy have also relied on self-report measures (e.g., Matsui et al., 1990; Phan, 2012), which highlights the need for further advancement in this area. Researchers may consider qualitative methods, such as in-depth interviews, to gather additional information regarding adolescents’ individual experiences with the sources that may not be captured using Likert-type instruments, including the unique impact of each source as well as how they are integrated and weighed (Phan, 2012).

Third, this study is limited by a small sample size, particularly of female adolescents with ADHD. Although this is in part a reflection of gender ratios in ADHD, future studies should strive to examine female adolescents with ADHD, as they are often
understudied and there is a need to understand the potentially unique vulnerabilities of this group. Previous research by Major et al. (2013) suggested that there may be gender differences in the SESRL beliefs of adolescents with ADHD. Although the present study did not replicate this finding, both of these studies were limited by a small sample size of females, making it challenging to draw any firm conclusions. Furthermore, the relatively small overall sample size also limited the number of factors that could be included into the structural model. Although IQ and achievement were ruled out via a regression analysis as significant predictors of school engagement, these and other confounding variables (e.g., anxiety diagnosis) are important to consider in future research. In the current study, the examination of inattention symptoms and the sources of self-efficacy sheds light on the potential factors that may account for the lower SESRL beliefs of adolescents with ADHD (e.g., symptoms of inattention, mastery experiences, social persuasion). However, given that the structural model only accounted for 44% of the variance in engagement, there may be other variables that require investigation in order to further our understanding of why adolescents with ADHD view themselves as less capable and less engaged than their non-ADHD peers. It is widely accepted that ADHD is a heterogeneous disorder with high rates of comorbidity and associated difficulties (American Psychiatric Association 2000; Barkley 1990). Research has demonstrated that the presence of co-occurring difficulties, such as low mood or aggression, can impact the self-perceptions of students with ADHD (see Owens et al., 2007 for a review). For instance, boys with ADHD with high levels of aggression tend to provide overly positive estimates of their abilities relative to ADHD boys with low levels of aggression, particularly in the social and behavioural domains (Hoza et al., 2002). As previously
noted, both self-efficacy and school engagement may also be impacted by adolescents’ EF skills, such that adolescents with EF impairments may have less access to the sources of self-efficacy, which may lead to lower SESRL beliefs and disengagement at school. Given evidence for a PIB in ADHD (Hoza et al., 2010; McQuade et al., 2011), future research may benefit from including objective measures of self-regulation and/or EF, not only to examine their influence on self-efficacy and engagement, but also to assess the accuracy with which adolescents rate their SESRL beliefs. Other potential antecedents that may be of value to explore include how much adolescents value and are interested in the task, the relevance of the task for their future goals, or their levels of self-esteem. There is evidence, for example, that high self-esteem and self-concept exert a positive influence on self-efficacy (Ahmed & Bruinsma, 2006; Dodgson & Wood, 1998; Lane, Jones, & Stevens, 2002; Phan, 2010). Given that lower levels of domain-specific self-concepts have been found in children with ADHD (e.g., Anderson et al., 1989; Hinshaw et al., 2006; Owens et al., 2007; Rucklidge & Tannock, 2001), it may be of value to examine the relationship between these two self-constructs.

Furthermore, given the complexities of the classroom environment, there are no doubt several other relevant psychosocial or contextual antecedents not explored in the present study that may exert their influence on SESRL beliefs. For instance, there is evidence to suggest that youths’ perceptions of their teacher’s attitude toward students and their learning (e.g., mastery oriented; caring and warmth towards students) contributes to the prediction of self-efficacy beliefs (Fast et al., 2010). Other contextual factors, such as access to academic supports, peer group influences, parent involvement, or broader social-cultural factors may also be valuable to investigate. How does, for
example, the level of parent involvement in their children’s academics shape their children’s self-efficacy beliefs? Do adolescents who have access to special education services and other learning supports fare better than those who have little or no access to such resources, and are some of these supports more influential than others in fostering self-efficacy? To what extent do peer influences, such as the degree to which peers value school, play a role? Adolescents who are at risk for learning challenges, such as those with ADHD, may be particularly susceptible to the impact of these environmental influences. Furthermore, there is evidence for cross-cultural differences in ratings of general self-efficacy (e.g., Scholz, Dona, Sud, & Schwarzer, 2002; Schwarzer, Bäßler, Kwiatek, Schröder, & Zhang, 1997), indicating that the role of language and cultural influences would be valuable to explore in future research. The present study provided a preliminary investigation of the factors that contribute to low SESRL and student engagement in ADHD. With a larger sample size, researchers may have the advantage of testing Bandura’s model in each of the ADHD and comparison groups and/or across males and females. This would allow for the addition of other relevant variables noted above as well as permit researchers to compare the model fit across groups.

Fourth, due to the small sample size limiting the number of parameter estimates that could be entered into the structural model, the sources were represented as a single latent variable rather than examining the independent effects of each source. Previous research has found that there are differences in the relative impact of the sources of self-efficacy on self-efficacy beliefs. Specifically, mastery experiences tend to consistently emerge as the most powerful predictor of self-efficacy beliefs, whereas the other sources may only demonstrate marginal effects on self-efficacy (Hampton, 1998; Lopez & Lent,
For example, in a recent study, Phan (2012) used structural equation modeling and found that only mastery experiences and vicarious experiences influenced self-efficacy beliefs in typically developing children. Adolescents with ADHD in the present study differed from their non-ADHD peers in reported mastery experiences and verbal encouragement; however, they reported similar levels of vicarious experiences and physiological arousal as comparison adolescents. Thus, some sources may exert a greater influence on self-efficacy beliefs and these relationships may differ as a function of group status (ADHD versus non-ADHD). Future research in this domain may offer a more fruitful examination of Bandura’s self-efficacy model by separating each of the four sources of self-efficacy and assessing their relative impact on SESRL in each the ADHD and comparison groups.

Fifth, although the present study used SEM to provide stronger statistical grounding regarding the relations among the variables of interest, it is still limited by a cross-sectional design. Combining SEM with a longitudinal approach would allow researchers to make stronger conclusions regarding potential cause-and-effect relationships among inattention, the sources, SESRL, and engagement. Additionally, there is evidence for a decrease in the predictive power of the sources on self-efficacy with the passing of time (Phan, 2012), as well as temporal changes in the impact of self-efficacy beliefs on future academic performance and achievement-related outcomes (e.g., Pajares & Kranzler, 1995; Pajares & Valiante, 1999; Skaalvik & Rankin, 1998). Thus, a longitudinal design would also allow for an investigation of how the sources and SESRL function and change over time.
Sixth, the present study relied on student engagement as an outcome variable due to its role in predicting high school dropout and achievement. However, future research, particularly longitudinal studies, may consider directly measuring school dropout and grades and determining the extent to which SESRL beliefs predict these outcomes. This is especially important given that adolescents with ADHD are at a considerable risk for low achievement and dropout (Barbaresi et al., 2007; Bauermeister et al., 2007; Ek et al., 2011; Frazier et al., 2007; Lahey et al., 2004; Rogers et al., 2011), putting their future educational and vocational opportunities at risk. Thus, understanding the relative impact of SESRL on achievement and school dropout in adolescents with ADHD can help inform existing programs designed to support school retention in this vulnerable population of youth.

**Implications for Clinicians and Educators**

Findings from the present study have several important implications for professionals who work with adolescents with ADHD. In clinical and educational settings, there tends to be a focus on pre-existing ability and skill when seeking to understand and evaluate the academic functioning of adolescents with ADHD. However, this study suggests that clinicians and educators should also attend to adolescents’ confidence levels, as this information may help us develop a greater understanding of the factors that may be contributing to the low classroom engagement, poor self-regulation, and negative academic outcomes faced by adolescents with attention difficulties and a clinical diagnosis of ADHD. Although no amount of confidence can lead to success when requisite skills and knowledge are absent, self-efficacy beliefs are powerful in that they dictate how individuals use the knowledge and skills that they possess—there may be
little incentive for adolescents to persist in the face of difficulty unless they believe that their actions can produce a desired outcome (Pajares, 1996; Bandura 1986, 1997; Zimmerman, 2000). This may be especially true for adolescents with ADHD whose motivational style is characterized by an altered sensitivity to reward, such that they may have difficulties sustaining motivation if the task is not immediately gratifying (Carlson & Tamm, 2000; Kuntsi et al., 2001; Luman et al., 2005; Rosch & Hawk, 2013). It is important that clinicians and educators are mindful of this connection, given evidence that self-efficacy beliefs can predict performance beyond knowledge and skill (e.g., Zuffianò et al., 2013).

Clinicians or educators can gather information about adolescents’ self-efficacy beliefs in several possible ways. One approach would involve using formal measures, such as what was utilized in the present study. For instance, the SELF has an abbreviated version that may be effective for those seeking a more formal assessment of SESRL. The SELF-A is comprised of 19 items taken from the original form and assesses adolescents’ judgments about their ability to use self-regulated learning skills to overcome challenges related to note-taking, studying, test-taking, and reading. The SELF-A has demonstrated good psychometric properties and has the practical advantage of requiring approximately one-third of the time necessary for completion (Zimmerman & Kitsantas, 2007). Alternatively, for a less formal assessment, the clinician can simply ask adolescents with ADHD how confident they are in their ability to complete a particular task involving self-regulation. Over time, adults can begin to gauge how self-efficacious adolescents with ADHD perceive themselves to be. By gathering this information directly from adolescents themselves, important insights about their beliefs can be acquired in a way
that may not be easily attained via observation or through other informants (e.g., parent-ratings).

The study results also have important implications for interventions designed to enhance the academic functioning of adolescents with ADHD. More specifically, the findings suggest that existing interventions that focus on building academic and/or self-regulation skills in ADHD may benefit from incorporating a component that addresses adolescents’ self-efficacy beliefs. Moreover, given that the present study demonstrated a positive relationship between the sources of self-efficacy and SESRL, this study sheds light on potential targets for enhancing SESRL beliefs in adolescents with attention difficulties. In adolescents with a clinical diagnosis of ADHD, educators and clinicians may want to pay particular attention to increasing mastery experiences and verbal persuasion given the lower ratings by adolescents with ADHD in these domains.

Fostering mastery experiences may involve direct teaching of pre-requisite skills needed to complete academic and self-regulatory tasks (e.g., Evans, Langberg, Egan, & Molitor, 2014). It may also involve ensuring that adolescents with ADHD are provided with the appropriate level of scaffolding and accommodations to support their learning. For instance, there is evidence to suggest that explicit training in the use of strategies that support goal-setting, project planning, note-taking, time management, and other learning skills may increase adolescents with ADHD’s successful completion of academic tasks (e.g., Jacobson & Reid, 2012; Mason & Shriner, 2008) and this may enhance their SESRL beliefs and subsequent classroom engagement. There is also a need to consider how we define mastery experiences or a student’s ‘success’ with a task. Adolescents with ADHD have more difficulty learning and they have to work harder in order to achieve
academic success that is comparable to their peers. Thus, in devising programs that support the academic development of adolescents with ADHD, it is important to consider personal success in learning. Educators, clinicians, and parents should cultivate an attitude that recognizes and appreciates individual growth and supports adolescents in valuing their own learning experiences and making the connection between their efforts and improvements in their learning. Research has indicated that students who experience academic success as a result of their efforts and strategy use, regardless of having learning challenges, are more likely to put forth a consistent effort and strive for success (Meltzer, Katzir, Miller, Reddy, & Roditi, 2004). These are the aspects of student learning and achievement that should be acknowledged when providing adolescents with verbal persuasion. Thus, what grade students’ receive should not be of primary concern; rather, educators and parents alike should attend to students’ efforts and the strategies they used in the processes. Adults should support adolescents in self-reflecting upon their efforts and use of self-regulated learning strategies and in applying this information constructively to facilitate future learning and strengthen their self-efficacy beliefs. In addition, because adolescents with ADHD have more challenges relative to their peers with academic tasks and self-regulation, they may require more frequent and salient verbal encouragement. This may be especially true given evidence for altered reward sensitivity in ADHD (Douglas, 1989; Haenlein & Caul, 1987; Sergeant et al., 1999; Sonuga-Barke, 2002). Thus, verbal feedback may need to be more explicit and immediate in order for adolescents with ADHD to incorporate and interpret this information in a manner than can be used to foster their self-efficacy beliefs.
Boosting self-efficacy beliefs may also involve supporting adolescents in understanding the challenges that accompany their disability and their unique strengths and difficulties. Programs aimed at increasing self-awareness and self-help skills are important so that individuals can become aware of the types of accommodations and supports available to them. It is also important that adolescents with ADHD feel empowered to strive in the classroom despite their learning and attention difficulties. Thus, rather than focusing on deficits or areas of difficulty, educators and clinicians should focus on enhancing individual growth, while emphasizing adolescents’ competencies, interests, and adaptive potential. School psychologists can offer valuable support in helping adolescents with ADHD develop a greater understanding of their disorder, including how they can identify their own strengths to compensate for areas of difficulty.

As results from this study demonstrate, the effect of symptoms of inattention on SESRL beliefs and engagement at school was indirect through the influence of the sources of self-efficacy. This finding suggests that helping inattentive students develop skills and strategies to improve their focus may indirectly boost their self-efficacy beliefs and engagement. For instance, there is evidence to suggest that children with ADHD show improved engagement and performance on a task when the characteristics of the task are modified to be more novel or interesting, thereby improving attention (Beike & Zentall, 2012). Given that both SESRL and student engagement are predictive of important outcomes such as grades and school retention, there is substantial value for the ongoing study of these motivational variables in ADHD.
Conclusion

This research study has made a novel contribution to our understanding of motivation in ADHD and provides researchers and clinicians with greater awareness of the way in which adolescents with ADHD perceive themselves and their school experiences. Although this investigation is not without its limitations, it has provided preliminary evidence that adolescents with ADHD are less confident than their peers in their ability to self-regulate their learning and that they perceive themselves as having less success at school, less positive encouragement from others, and lower levels of interest and engagement in school. This research has also highlighted the indirect relationship between inattention and engagement through the sources of self-efficacy and SESRL beliefs. Thus, adolescence appears to be a time when individuals with ADHD do not hold positive perceptions of their capabilities related to self-regulation, and future research should continue to explore the antecedents of self-efficacy as well as the influence of negative self-perceptions on outcomes such as academic performance, school retention, and vocational opportunities. Given that a strong sense of self-efficacy supports student learning and achievement, academic interventions for adolescents with ADHD should not only focus on building skills, but should also address the attitudes and beliefs that adolescents with ADHD hold about themselves and their abilities.
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