

Teachers' Knowledge of, Satisfaction With, and Familiarity With Supporting Students
With Attention-Deficit/Hyperactivity Disorder

Jason Uttamsingh, B.Sc., M.S.Ed.

Department of Graduate and Undergraduate
Studies in Education

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Faculty of Education, Brock University
St. Catharines, Ontario

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Abstract

This study explored teachers' knowledge of ADHD, levels of satisfaction with strategies to successfully teach students with ADHD in the classroom, and familiarity with related resources and policy. Participation was voluntary, and teachers electing to participate completed a survey designed to capture data relating to the areas noted above. The sample of teacher participants was taken from one of the largest public school boards in Ontario, and included teachers of varying years of experience, special education and non-special education teachers, and both elementary and secondary teachers. Results indicated that teachers were generally dissatisfied with their abilities to teach students with ADHD. Special education teachers seemed to be more satisfied with their abilities to use successful strategies to teach students with ADHD compared to non-special education teachers, and special education teachers also seemed to be more familiar with related resources and policies compared to non-special education teachers. In addition, special education teachers seemed to have more working knowledge of the nature of ADHD as a disorder compared to non-special education teachers. Results also indicated possible areas for a lack of knowledge about ADHD among teachers in general, including diet, age, and genetics in relation to the nature of ADHD and the propagation of symptoms indicative of the disorder. Years of teaching experience also seemed to play a part in teachers' knowledge of certain areas. Implications include possible further training for teachers to address knowledge gaps and to enhance teachers' abilities to better instruct students with ADHD in their classrooms.

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CHAPTER ONE: INTRODUCTION TO THE STUDY

Attention Deficit/Hyperactivity Disorder (ADHD) can be challenging for children, adolescents, and adults. ADHD is not only challenging for those individuals who have the disorder, but also for those who regularly interact with these individuals. The management of the disorder can be challenging in various settings, such as home, work, or school. Educational and healthcare professionals alike continue to strive to better understand the disorder, and how to effectively manage it.

Educational professionals, most specifically classroom teachers in Ontario, commonly encounter ADHD-like symptoms among many students in Ontario schools (Hoff, Ervin, & Friman, 2005). It is beneficial for teachers of students with ADHD or ADHD-like symptoms to better understand the disorder, and to effectively utilize instructional strategies to help to enhance the learning of students influenced by such symptoms. In order for this to occur, classroom teachers in Ontario need to become more familiar with the symptoms indicative of ADHD, the nature of these symptoms, and strategies that can be used in schools and in classrooms to help to reduce the negative impacts of these symptoms on student learning and achievement in school (Jerome, Gordon, & Hustler, 1994; Vereb & DiPerna, 2004). A greater recognition of ADHD by school boards may arguably be an essential first step, as the disorder is not currently recognized as a category of exceptionality in Ontario (Ontario Ministry of Education [OME], 2001). Even unofficial recognition of symptoms by school boards under the umbrella of current special education policy for identification in Ontario (e.g., *learning disabled* or *behavioural*) may be helpful (OME, 2009).

Background of the Problem

ADHD is a heavily researched, neurological disorder (Barkley, 2008, 2015; Nigg & Casey, 2005) and there is a growing amount of research looking into the biological nature of ADHD (Poissant, Mendrek, & Senhadji, 2014). The current fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) describes ADHD as “a persistent pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development, as characterized by Inattention and/or Hyperactivity and impulsivity” (American Psychiatric Association [APA], 2013, p. 59). The DSM-5 defines three manifestations of ADHD, which include the combined presentation, the predominantly inattentive presentation, and the predominantly hyperactive-impulsive presentation. The DSM-5 also includes a prescribed set of nine symptoms exclusively for each of inattention and hyperactivity/impulsivity (APA, 2013, pp. 59-60). In order for an individual to be officially diagnosed with either the predominantly inattentive type, or the predominantly hyperactive-impulsive type, he/she must have shown persistence of at least six of the nine symptoms for at least 6 months, in such a manner that is developmentally impairing, and impacts directly in a negative way on social and academic/occupational activities. Additional criteria must include the presence of some symptoms before the age of 12, several symptoms present in at least two different settings (such as school and home), clear evidence that symptoms interfere with or reduce the quality of functioning within a social, academic, or occupational context, and the symptoms cannot be better explained by another mental disorder, and that the symptoms do not occur exclusively during the course of schizophrenia or another psychotic disorder (APA, 2013, p. 60). In order for an individual to be diagnosed with the combined

presentation, he/she must exhibit at least six of nine symptoms from each set of those symptoms prescribed for the predominantly inattentive type, and for the predominantly hyperactive-impulsive type for at least 6 months.

A growing amount of research also exists that investigates how ADHD can impact the education of students, and strategies that can be utilized to accommodate students with ADHD-like symptoms in schools (Tannock, 2007). Several studies have investigated teachers' levels of knowledge about ADHD, and the viability of coping strategies implemented by teachers for students. Some studies have suggested that teachers are generally not knowledgeable about ADHD (Akram, Thomson, Boyter, & McLarty, 2009; Ghanizadeh, Bahrader, & Moeini, 2006; Kos, Richdale, & Jackson, 2004; Scitutto, Terjesen, & Bender Frank, 2000) while other studies have suggested that teachers possess adequate knowledge of ADHD as a disorder but do not implement adequate coping strategies or interventions for students with ADHD in the classroom (Nowacek & Mamlin, 2007; Ohan, Cormier, Hepp, Visser, & Strain, 2008; Stormont, 2008). Having adequate strategies and interventions put in place by teachers is important to help students with ADHD succeed in school.

The underlying reasoning behind the choice of strategies for learning for individuals with ADHD is to allow for adequate cognitive processing, and to ensure that a cognitive load is manageable (Tannock, 2008). Tannock's philosophy has been to bridge the gap between the neuroscientific understanding of ADHD and strategies for learning. This philosophy emphasizes that there is a significant correlation between school and the home with regard to success of strategies. It is therefore important that parents and teachers work together to help students with ADHD to be successful in school (Barkley,

1998; Tannock, 2008). Being proactive with strategies that enhance engagement and allow for continued feedback is essential. It is important to identify learning needs for students as early as possible, and to allow for a successful proactive approach. More recently, working memory has been emphasized as an important part of this proactive approach. This includes measuring deficits in working memory (Normand & Tannock, 2012) as well as working memory training for students (Gropper, Gotlieb, Kronitz, & Tannock, 2014).

For students with ADHD, self-regulatory behaviours are a challenge. These include following a teacher's instructions, staying on task in the classroom, integration of skills, multitasking, planning, and managing time to name a few. Strategies to assist with self-regulation may include direct instruction, targeting instruction during specific tasks, explicitly teaching students how to proceed versus having them work completely independently, external prompts to indicate appropriate behaviours/routines, external cues to follow instructions, and/or explicit instruction in self-monitoring, problem solving, and goal setting. In addition, processing speed is a common challenge for students with ADHD. It is therefore important to allow extra time to complete assignments, follow instructions, and/or answer a teacher's questions.

Language and reading-related difficulties can also affect students with ADHD (Tannock, 2008). Language difficulties can result in communication breakdowns in the classroom or in social situations. These difficulties can also make comprehension of verbal instructions and of written text more difficult. Strategies to assist with these difficulties may include frequent monitoring of progress, considerable structure, multiple opportunities for engagement and feedback, direct assistance with the reading/writing

process, rewording of problems to be solved, identification of keywords/concepts, scaffolding, and/or incorporation of real-world scenarios and prior knowledge.

Educational policy is a very important area to consider. There is currently no official means of identifying a student with ADHD, in terms of a category of exceptionality, in Ontario (OME, 2001). This is also the case in other Canadian provinces and in U.S. and Australian jurisdictions as well (OME, 2001). In most jurisdictions, both North American and international, ADHD is not recognized as an exceptionality in itself in terms of educational policy (Alberta Learning, 2004; British Columbia [BC] Ministry of Education, 2016; Burge, Ouellette-Kuntz, Hutchinson, & Box, 2008; Curtis, Pisecco, Hamilton, & Moore, 2006; Efron, Sciberras, & Hassell, 2008; OME, 2001 Prosser, Reid, Shute, & Atkinson, 2002). In Ontario, current categories of exceptionalities include Behaviour, Communication, Intellectual, Physical, and Multiple (OME, 2001). In order for a student with ADHD in an Ontario classroom to receive accommodations according to special education policy, he/she would have to exhibit characteristic challenges that fall under one or more of the above current categories. Within the context of Ontario policy, there is of course the means to accommodate for students based on recognized needs in more of a case-by-case basis. This approach is certainly useful for students with ADHD, which may not involve clear identification under an established category, as mentioned above. For example, *Learning for All* (OME, 2013) emphasizes the importance of a shared understanding of students' unique patterns of learning. The underlying philosophy here involves looking at each student as a unique learner, and what this would mean in terms of specific needs for each student, compared to characteristic accommodations relating to the established aforementioned categories.

There has been debate as to whether or not adjustment of categories to more readily fit ADHD, or incorporation of an ADHD category would be useful in terms of taking steps to better accommodate for students with ADHD in classrooms. The underlying issue in this case focuses on incorporation of ADHD more directly into a policy framework versus making sure that teachers are able to adjust strategies to assist students with ADHD in the classroom. Russell Barkley describes incorporating ADHD into a category of exceptionality, without considering details of learning difficulties, and how to best address these details in the classroom as a “largely irrelevant exercise” (as cited in Prosser et al., 2002, p. 71). Rosemary Tannock (2007) argues more in favour of ADHD as a recognized exceptionality in itself with respect to the benefits of inclusion into policy, despite the financial implications of doing so: “It would be like a case of short-term financial pain for long-term national gain in human and social capital” (p. 2).

Statement of the Problem Context

There are many students with special needs in Ontario classrooms and it is important for educators to be able to accommodate successfully for these students (Burge et al., 2008; OME, 2001). Since ADHD is not currently recognized as an exceptionality on its own (OME, 2001), students with ADHD may not receive accommodations to assist learning if their specific challenges cannot be placed under the current categories of exceptionalities. This would make accommodating for students with ADHD more challenging for teachers, and it would therefore be beneficial for teachers to have a working knowledge of ADHD as a disorder, and to be reasonably comfortable with implementing strategies for these students. For these reasons, it is useful to assess teachers’ knowledge of ADHD and comfort levels with strategies that may be used in

classrooms to assist students with ADHD. Research in the area of teachers' knowledge of ADHD has shown varying levels of familiarity with the disorder (e.g., Bekle, 2004; Efron et al., 2008; Jerome et al., 1994; Sciutto et al., 2000; West, Taylor, Houghton, & Hudyma, 2005). In addition, teachers have varying opinions about special education and any strategies that may exist to better accommodate for students with ADHD in the classroom (Jerome et al., 1994; Sciutto et al., 2000). Continued research in the areas of teachers' knowledge of ADHD and teachers' use of strategies to accommodate for students with ADHD in the classroom is useful in order to gain a greater understanding of how students with ADHD can best be accommodated for in the classroom. Furthermore, a greater understanding in this area may also help to inform policy, and specifically what policy may need to look like in order to give teachers the knowledge and skills to best accommodate for students with ADHD in their classrooms.

The overall purpose of this research study has been to explore the readiness of teachers to successfully manage students with ADHD in their classrooms. This has involved exploring teachers' levels of satisfaction with strategies (and perceived availability of strategies) for dealing with students with ADHD in the classroom. In addition, teachers' levels of satisfaction and levels of familiarity with special education resources in general were also assessed, as well as teachers' levels of knowledge of ADHD as a disorder. It was also the purpose of this research study to analyze the collected data (as described above) in order to discuss possible future implications for how teachers may deal with ADHD in their classrooms. The required data was collected by means of a questionnaire administered to teachers.

The intended primary audience for this research study encompasses those within

the profession of education. Of educational professionals, teachers will relate most closely to this study. Although any professionals interested in any of the major aspects of this study (such as ADHD, classroom instructional strategies, educational policy, teachers' voices through survey research, etc.) will be able to benefit from this study, the classroom teacher will be able to make the most parallels to his or her role(s) in the classroom. This study involved both secondary and elementary teachers as participants. Incorporation of feedback from secondary teachers is important as most studies to date that have assessed teachers' knowledge and attitudes about ADHD, and school-based interventions for students with ADHD, have involved mainly elementary teachers (DuPaul & Weyandt, 2006b; Evans, Serpell, Shultz, & Pastor, 2007).

Research Questions

The questions posed in this research study included the following:

- Do teachers express satisfaction with strategies available to them to deal with ADHD in the classroom?
- Are teachers knowledgeable about ADHD as a disorder?
- Is there a relationship between years of experience and:
 - satisfaction with means to deal with ADHD in the classroom?
 - knowledge of the disorder?
 - familiarity with special education policy/resources?
- Are there any significant differences between general teachers and those teachers that report that they teach special education classes in terms of:
 - satisfaction with means to deal with ADHD in the classroom?
 - knowledge of the disorder?

- familiarity with special education policy/resources?
- Do significant differences exist between elementary and secondary teachers in:
 - satisfaction with means to deal with ADHD in the classroom?
 - knowledge of the disorder?
 - familiarity with special education policy/resources?

Rationale

As an educator, I am interested in making sure that all students have opportunities to be successful in school, and that teachers have the knowledge and skills to accommodate for students with special learning needs in their classrooms. I am a secondary school teacher, and I began my career approximately 13 years ago. Over the years I have taught students with diverse needs including students with attention difficulties. I found that unless a teacher actively seeks the knowledge and skills to better accommodate for students with diverse learning needs in the classroom, these students often do not benefit from instructional strategies that may assist their learning. In addition, I have also found that many teachers are unaware of some of the details of special education policy, both at the Ministry and school board levels, that may inform their practice, as well as strategies that may be readily available to assist students with special learning needs (such as attention difficulties) in the classroom.

As I have been learning about ADHD I have realized that I was previously not aware of the nature of the disorder, and I also realized that many teachers are not aware of this nature. Awareness is often the first step to initiating change and if teachers are not aware of the nature of ADHD it makes it difficult to know how to effectively handle students with attention difficulties in the classroom. In addition, I feel that continued

research into the areas of teachers' knowledge of ADHD, as well as teachers' perceptions of their abilities to successfully manage students with ADHD in the classroom is very useful and important. Continued research in the above areas is helpful because a greater understanding of teachers' knowledge of ADHD and how they feel about managing students with the disorder may have implications for special education policy at the Ministry and/or school board levels. Examples of these implications may include refinement of special education policy and/or a focus on helping teachers' to increase their knowledge of ADHD and/or their skills to assist the learning of students with ADHD in the classroom.

Kos, Richdale, and Hay (2006) emphasize that although there have been several studies investigating teachers' knowledge of ADHD, there is disagreement among the results of different studies, with some suggesting a higher knowledge base than others, which can be problematic given that teachers' and schools are a major source of information for parents. Many of the aforementioned studies have also suggested that there is room for improvement in teachers' knowledge of ADHD. In addition, there have been relatively few studies that have adequately assessed attitudes and beliefs of teachers teaching students with ADHD (Bekle, 2004; Kos et al., 2006). Furthermore, there is not a wealth of information pertaining to the knowledge and attitudes of teachers that teach students with ADHD (Kos et al., 2006), nor is there a solid understanding of the impact of teachers' attitudes, beliefs, and practices on the treatment, behaviour, and education of children with ADHD (Sherman, Rasmussen, & Baydala, 2008). Burge et al. (2008) suggest that the adult public in Ontario generally perceives that teachers are ill-equipped to teach children with intellectual disabilities, and that schools generally do not have the

resources to teach these students. There has been relatively little investigation of behaviour strategies used by teachers teaching students with ADHD, or reasons behind the use of these strategies (Kos et al., 2006) even though teachers are often the primary source of referral for students with ADHD (Sherman et al., 2008). Furthermore, Freedman (2016) emphasizes the importance of approaches that foster inclusivity in the classroom for students with ADHD.

This study allowed classroom teachers to describe their various levels of satisfaction and knowledge relating to handling ADHD in the classroom. This information may potentially inform our current policy situation in Ontario, and whether or not current policy is best suited toward accommodating for students with symptoms indicative of ADHD. As Prosser (2008) notes, “ADHD is an identity that needs to be understood, not just as a medical theory, but as a social phenomenon and a pedagogical challenge” (p. 93).

Scope and Limitations

The study took the form of an electronic questionnaire made available to a sample of elementary and secondary school teachers in a school board in Ontario. Approximately 250 elementary teachers and 250 secondary teachers were invited to complete the questionnaire. Individual elementary and secondary schools were selected by the researcher until the quota of elementary and secondary teachers invited to complete the questionnaire had been filled. Information about the number of teachers working at a particular school was obtained from the school board’s website, and schools were randomly selected from each of the cities constituting the school board. Even though efforts were made to select a representative sampling of teachers in the school board, the

specific sample selected may limit the scope of the study and any generalization of results and/or implications to teachers in the school board and/or teachers in Ontario.

The findings of this research study are dependent upon teachers being forthcoming and truthful in their answers to the survey questions. There is the potential for teachers to be reluctant to answer knowledge-based questions truthfully even though teachers will be informed that all responses are anonymous. This possibility also exists for the other types of survey questions, such as those asking about professional information or perceived familiarity or comfort levels with certain strategies or policies. As a teacher, I may feel concerned or worried that I may be lacking in knowledge or familiarity with certain content covered in some of the survey questions. This concern may lead some teachers to be less forthcoming when responding to certain survey questions, with the hope of possibly appearing more knowledgeable about ADHD or more familiar or comfortable with certain policies or strategies. From a statistical standpoint, analyses of responses may be less accurate if based on responses that are not completely forthcoming, and any interpretations and/or generalizations of these data may be less accurate or increasingly limited. For example, when testing for possible significant differences between elementary and secondary teachers, with regard to familiarity with current policies, such an analysis may not yield accurate conclusions if teachers were not forthcoming with their true levels of familiarity with certain policies. Furthermore, the purpose of this study is not to try and address all issues surrounding ADHD, but to focus specifically on the classroom teacher, and what teachers in schools can do, within their own means, to accommodate for students with symptoms indicative of ADHD. It is not the purpose of this study to directly address issues pertaining to

medication for ADHD. This is a separate issue to what teachers in schools have control over, and this study is meant to focus specifically on educators, and not healthcare professionals.

This chapter has highlighted key areas to provide context and justification for this study. The research questions for this study allow for exploration of areas identified in the literature as areas warranting continued exploration. The rationale provided also extends justification for the areas explored in this study based on the importance for teachers to have the means, and the right skill-set to successfully teach students with ADHD in their classrooms. The next chapter examines a review of related literature for this study.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

This chapter provides a review of important literature related to the research questions for this study. Areas of review include the nature of ADHD as a disorder, teachers' knowledge of ADHD, the role of teachers, strategies for instructional intervention and professional development, and a snapshot of the current policy situation. The areas of teachers' knowledge and current policy highlight both North American and international perspectives, and with regard to policy, there is also mention of Canadian provinces beyond Ontario.

Nature of ADHD

According to Barkley (n.d.), the three predominant features of ADHD include: impaired response inhibition, impulse control, or the capacity to delay gratification; excessive task-irrelevant activity or activity that is poorly regulated to the demands of a situation; and poor sustained attention or persistence of effort toward completion of tasks. Barkley (2008) emphasizes that ADHD is largely based on motor function (i.e., how behaviour is planned, organized, and executed) rather than on perception. It is not that an individual with ADHD perceives information differently than others, but rather the issue is how this individual deals with these perceptions. This is indicative of the inability to sustain a response, resulting in a decreased ability to suppress irrelevant events, or a decreased resistance to distraction. An individual's working memory is a key proponent of this phenomenon, and tends to be depleted in individuals with ADHD. Tannock (2008) refers to working memory as a mental workspace whereas Barkley refers to this as "remembering to do". Both Tannock and Barkley agree that working memory is one of the executive functions (these are discussed below) that is impaired in individuals with

ADHD. Barkley (2008) further describes this depleted working memory as a reduced capacity to hold in mind what an individual is doing, resulting in increased distractions and deviations from tasks.

The Brown Clinic (n.d.) views ADHD as a disorder of executive functions. It is when there are impairments in these functions and/or their interrelationships that symptoms of ADHD are manifested. Brown describes six separate clusters, including: Activation (organizing, prioritizing, and initiating work); Focus (sustaining and shifting focus to tasks); Effort (regulating alertness, sustaining effort, and processing speed); Emotion (managing frustration and modulating emotions); Memory (utilizing working memory and accessing recall); and Action (monitoring and regulating self-action). Brown notes that many examples of common difficulties faced by individuals with ADHD can be traced back to one of these clusters. Tannock (2008) adds that executive functions organize actions and emotions to control intentional behaviour, and describes the role of the executive functions as involved in dynamic, moment-to-moment processing of information, planning, and decision making. Tannock (2008) also refers to sub-functions, which include identifying a problem, developing/executing plans, organizing self and activities, inhibiting actions/regulating emotions, resisting distractions/ controlling attention, and self-monitoring/self-evaluating thoughts and actions. There are disorders that are commonly comorbid with ADHD. These include anxiety/mood disorders, depression, Oppositional Defiant Disorder (ODD), and Conduct Disorder (CD). Tannock (2008) affirms that hyperactivity/impulsivity is more closely associated with ODD and CD, where symptoms of hyperactivity diminish with age and become a more impulsive

“inner restlessness” in adulthood, whereas inattention is more closely associated with diminished academic achievement.

Barkley (2008) had further elaborated (with reference to previous DSM criteria) that hyperactivity itself may not be a separate subtype, but merely a juvenile form of the combined type. Barkley had also stated, again with reference to previous DSM criteria, that the three DSM subtypes are not separate versions of ADHD but merely variations in severity, where inattention may be a separate disorder in itself, due to key cognitive differences with hyperactivity/impulsivity. Barkley had predicted that the current DSM-5 criteria would better reflect these differences between inattention and hyperactivity/impulsivity, providing a more useful approach for diagnosis.

According to Barkley (1998, 2008) there was a need for a new underlying theory for ADHD to better reflect the nature of the disorder, in addition to what was part of the previous DSM criteria, which was, as Barkley (2008) had stated “a description of someone’s behaviour”. Barkley (1998) had also outlined key components of the nature of ADHD that a new theory would have to reflect, as well as the reasoning behind these choices. In short, Barkley (1998) had claimed that the nature of ADHD is more complex than the subtypes indicative of the previous DSM criteria for diagnosis:

The origin of ADHD is not felt to reside within the sensory information and attentional processing functions of the brain. The current clinical description of ADHD (DSM-IV) makes no attempt at such delineations, important as they are for understanding the basic nature of the disorder. (p. 227)

Barkley (1998) had also stated that a new theory must link hyperactivity-impulsivity and inattention with executive/metacognitive functions, since cognitive deficits associated

with ADHD fall within the realm of self-regulation or executive functions (p. 228).

Barkley (1998) describes self-regulation as follows:

Self-control (or self-regulation) is any response, or chain of responses, by the individual that alters the probability of their subsequent response to an event and, in so doing, functions to alter the probability of a later consequence related to that event. (p. 232)

Self-regulation is also described as a kind of drive that maintains actions toward the attainment of goals, even in the absence of external rewards (Barkley, 1998, p. 239).

In addition, executive functions are described as having a common purpose “to internalize or privatize behavior to anticipate change and the future” (Barkley, 1998, p. 233). Other components that Barkley believes must constitute a new theory of ADHD included behavioural inhibition, non-verbal and verbal working memory, reconstitution of behaviour, and the issue of sustained attention. Barkley (1998) outlines that behavioural inhibition includes three key components: inhibition of an initial response, stopping an outgoing response/delaying the response until a decision is made to continue it, and protecting self-directed responses from disruption by competing events or responses (p. 229). Barkley (1998) describes verbal working memory as “internalization of speech” (p. 238) and non-verbal working memory is described as “The capacity to maintain internally represented information in mind or on line that will be used to control a subsequent response” (p. 235). Barkley notes that reconstitution (analysis and synthesis) of behaviour is essential, as it is a challenge for individuals with ADHD to properly order or sequence sets of appropriate behaviours. Similarly, the challenge of poor sustained attention, leading to inattention, must be clearly reflected by a new model. Finally,

Barkley (1998) emphasizes that ADHD is a disorder of performance rather than skill, that “time blindness” is an ultimate disability for those inflicted with ADHD, and that an understanding of this phenomenon, with utilization of a new model for diagnosis, will be critical: “Understanding time and how one comes to organize behaviour within it and toward it, then, is a major key to the mystery of understanding ADHD” (p. 251).

ADHD is physiological in origin. Differences in the functioning of certain neurological pathways are what cause the symptoms indicative of ADHD. In order for these neural pathways to operate correctly, brain chemicals known as neurotransmitters (such as dopamine and norepinephrine) must be transmitted across synapses correctly. In individuals with ADHD, neurotransmitters may not move across synapses in such a way to allow proper functioning of neural pathways. Irregular transmission that occurs in this way can manifest symptoms of ADHD. There are genes that affect how these neural pathways operate. According to Barkley (Personal communication, December 21, 2008) there have been hundreds of papers published to date relating to genes associated with ADHD, and that in 5 to 10 years, the “risk genes” for ADHD will be known.

It is important to note that ADHD is highly hereditary, and that parents with ADHD will pass on genes to their children, which will contribute to the manifestation of ADHD in these children. Tannock (2008) states that ADHD is 80% hereditary, and is comparable to the level of heredity for height. Barkley (2008) states that 50% of children of an ADHD-inflicted adult will have ADHD. Barkley also states that hyperactivity/impulsivity tends to run in families with a prevalence of conduct issues, whereas inattention tends to run in families with a prevalence of learning disabilities. According to Barkley, many of the genes associated with ADHD that are holding up with subsequent

scientific analyses involve dopamine regulation. This includes an overrepresentation of the dopamine repeater gene (DRD4) in individuals with ADHD, and a dopamine transporter gene (DAT1) has also been implicated (Barkley, 1998, p. 172).

According to Barkley (Personal communication, December 21, 2008), there are five types of dopamine receptors in the brain, some of which are inhibitory and some of which are excitatory, depending on which receptor is being activated in which neural network, where at least three dopamine pathways have been identified in research studies as likely involved in ADHD, each yielding various symptoms seen in the disorder. Kopeckova et al. (2008) determined that the risk of ADHD is significantly increased in the presence of certain genes (alleles). These include a dopamine receptor gene (DRD2), a dopamine transporter gene expressed predominantly in the basal ganglia (DAT1), a gene responsible for coding for an enzyme that converts dopamine into norepinephrine (DBH), and a serotonin transporter gene (5-HTT).

In terms of specific neural pathways potentially associated with ADHD, Nigg and Casey (2005) present an integrative theory. This theory involves frontostriatal and frontocerebellar neural loops in the detection and prediction of the nature and timing of important events in the environment, and the interaction(s) of these loops with frontoamygdala loops relating to emotional connections to these events. It is noted that weaknesses in the development of these neural networks can lead to diminished cognitive and affective control by the prefrontal cortex, which can lead to many of the cognitive and neurological manifestations detected in individuals (specifically children in this study) with ADHD. Additional pathways are explored, but with admittedly limited clinical evidence for association with the phenotypes of ADHD.

Teachers' Knowledge of ADHD

A considerable number of studies assessed or attempted to assess teachers' levels of awareness and/or familiarity with the nature of and/or the symptoms or signs indicative of ADHD among students in schools. Several studies have utilized a survey or questionnaire approach to attempt to assess teachers' knowledge and awareness of ADHD by inquiring about certain aspects of the disorder.

North American Perspective

Jerome et al. (1994) investigated American and Canadian elementary teachers' knowledge and attitudes about ADHD utilizing a self-reported questionnaire that included demographic and knowledge-type questions. Analyses of knowledge components showed a generally good grasp of basic concepts about ADHD from both groups of teachers (Jerome et al., 1994), as well as an overall understanding by the teachers of the importance of using diverse strategies, beyond medication, when accommodating for students with ADHD. Jerome et al. noted that even though teachers demonstrated a basic understanding of ADHD, there were common misconceptions among several individuals in both groups. These misconceptions included believing that a diet high in sugar could cause or propagate ADHD, and that children outgrow ADHD. In addition, Jerome et al. noted that teachers in both groups reported receiving little in-service training in ADHD, and a yearning for more training. Analyses of responses from teachers in both groups also showed that although teachers viewed ADHD as a valid diagnosis, very few teachers (14%) were actually involved in the diagnostic process of ADHD in students (Jerome et al., 1994). Subsequent studies have investigated teachers'

knowledge of ADHD, with some studies finding similar results, and others finding contrasting results to Jerome et al.'s.

Sciutto et al. (2000) concur with Jerome et al. (1994) with regards to their findings that teachers hold misconceptions about ADHD. Of the 149 elementary school teachers who completed the Knowledge of Attention Deficit Disorders Scale (KADDS) assessment, Sciutto et al. found that teachers' scores on the symptoms/diagnosis subscale were significantly higher than scores on both the general information and treatment subscales. Previous experience and exposure to ADHD were positively related to knowledge of the disorder (Sciutto et al., 2000). Sciutto et al. found that teachers obtained higher scores on questions focusing on symptoms and diagnosis, compared to those questions focusing on treatment or general information about ADHD. This differs from the findings of Stormont and Stebbins (2005) which suggested a lack of confidence in teachers' abilities to assess ADHD in students. Stormont and Stebbins surveyed preschool teachers, and both Sciutto et al. and Jerome et al. surveyed elementary teachers. Furthermore, Weyandt, Fulton, Shepman, Verdi, and Wilson (2009) surveyed a sample of 132 teachers (general and special education) from kindergarten through grade 12 as well as school psychologists (by completing a 24-item questionnaire) about treatment and possible causes of ADHD. It was found that the results supported the hypothesis that school psychologists' knowledge level of ADHD will be significantly greater than that of general and special educators. Results did not support the hypothesis that special educators' level of knowledge would be significantly greater than that of general educators. Also years of experience was negatively associated with increased knowledge of ADHD.

International Perspective

Several international studies have been conducted that have investigated teachers' knowledge of ADHD, and there is a substantial Australian research base in this area indicating both comparable and contrasting findings to several North American studies (e.g., Bekle, 2004; Efron et al., 2008; West et al., 2005). In terms of overall knowledge about ADHD among teachers, some Australian studies have indicated a higher overall knowledge base for teachers than North American or other international groups, although possible connections between years of teaching experience (as opposed to years of experience specifically with students with ADHD) and breadth of knowledge are not clear (Efron et al., 2008). When comparing teachers to other groups of educators, specifically undergraduate students and parents, Bekle found that teachers answered knowledge-based questions more accurately than undergraduate students. This finding differs from a North American perspective as outlined by Jerome et al. (1999, as cited in Bekle, 2008) indicating that factual knowledge about ADHD was similar among teachers and undergraduate students. Furthermore, West et al. found that teachers' and parents' levels of knowledge about the causes of ADHD were significantly greater than their knowledge of overall the characteristics of ADHD as a disorder. West et al. also emphasized that misconceptions about knowledge of ADHD are significant, and that professional development plays a significant role in increasing teachers' knowledge of ADHD.

Kos (2004) assessed knowledge of ADHD among primary in-service and pre-service teachers. Although differences in levels of knowledge of ADHD were found through questionnaire responses between the groups, it was concluded that there was a deficit in knowledge of ADHD among both groups of teachers. Ohan et al. (2008)

surveyed elementary school teachers in Melbourne, Australia regarding their knowledge of ADHD and their perceptions of and behaviour toward students with ADHD. It was found that overall teachers demonstrated good knowledge of ADHD. It was also found that teachers with an average to high level of knowledge reported more helpful behaviours and perceptions by teachers. These teachers also reported feeling that these children would be more disruptive in class and reported less confidence in their classroom management abilities specific to these children. This study features questions from the ADHD Knowledge Scale proposed by Jerome et al. in 1994, which are used to assess teachers' knowledge of ADHD.

With regard to other international studies, Akram et al. (2009) explored knowledge and attitudes of Scottish experienced and student teachers toward ADHD. It was concluded that even though knowledge of ADHD would be useful for teachers when dealing with students in the classroom, teachers' levels of knowledge were inadequate. Experienced teachers responses indicated less satisfaction with knowledge of ADHD, more so than the less experienced teachers surveyed. Experienced teachers were also more likely to conclude that teachers are unable to adequately recognize symptoms. It was found that the teachers surveyed obtained most of their information about ADHD from other colleagues, as well as the Internet. Furthermore, Ghanizadeh et al. (2006) assessed knowledge and attitudes of Iranian teachers toward ADHD. It was concluded that knowledge levels were low. Over half of the respondents indicated they thought ADHD to be a result of parental spoiling, and less than half agreed that there was a biological nature to this disorder. In addition, the majority of participants felt that the same disciplinary procedures used for other students should be used for those students

with ADHD. Participants disclosed that their major sources of information about ADHD came from various media sources, as well as from friends and relatives.

Some additional international perspectives noted include teachers from Saudi Arabia, Jordan, Ireland, and New Zealand. Abed, Pearson, Clarke, and Chambers (2014) found that Saudi Arabian teachers did show some knowledge of the general characteristics of ADHD, but had little understanding of causes and possible interventions. The need for more formal teacher training regarding ADHD was also discussed. Similarly, Al-Omari, Al-Motlaq, and Al-Modallal (2015) found that many misconceptions about the causes and management of ADHD among Jordanian teachers were revealed. The need for reforming pre-service teacher preparation regarding supporting students with ADHD was noted. A study by Ward (2014) among a group of Irish primary school teachers indicated that they were more knowledgeable about ADHD symptoms and diagnoses than other associated features or treatments. Ward also indicates an improvement in knowledge among these teachers compared to previous studies using the same questionnaire. Finally, Curtis, Hamilton, Moore, and Pisecco (2014) compared teachers in New Zealand to those in the United States. Results indicated some significant differences between the groups regarding teachers' beliefs, and their preferences for classroom interventions for students with ADHD.

Teachers' Strategies for Intervention for Students With ADHD

Tannock (2008) states that the most at-risk ADHD students (for learning) are those with the combination of inattention, executive function difficulties including low working memory, and previous poor academic achievement. For these students in particular, new content with little prior knowledge, complex language, self-regulation,

timing, and high cognitive loads present exceptional challenges. For these students and others with ADHD, Tannock (2008) outlines the importance of instructional planning and the planning process. Five key components of the planning process are given. These include focusing on curriculum (analysis of content and class tasks), developing a student profile (including behaviours, strengths, and weaknesses), setting goals, developing an action plan (a range of achievable goals with corresponding instructional strategies), and monitoring progress. Tannock (2008) also outlines four key variables to consider when planning instruction. These include the learning context (i.e., enhancing engagement with peer tutoring), instructional language (informal vs. formal), instructional supports (techniques or concrete tools), and student learning strategies (explicit cognitive and metacognitive strategies for students). Teacher-directed and student-directed strategies can work in combination for older students to address common issues such as completing homework and/or behaviour management.

In addition, Robin (1998) describes a variety of possible accommodations for the secondary school setting that can be used for adolescent students with ADHD. Robin organizes these accommodations into nine categories: Homework Accommodations, Test-Taking Accommodations, Reading Comprehension, Lesson Presentation/Note Taking, General Organization, Motivational Techniques, Additional Support, Parent Involvement, and Input to Medical/Therapeutic Support (1998, pp. 265-267). Robin notes that, like medications, strategies for learning should be formulated on a case-by-case basis, as different students with ADHD will have differential success with various strategies for learning, just as different students will respond differently to various medications. With regard to this case-by-case approach, Hoff et al. (2005) collected

assessment data for an adolescent diagnosed with ADHD to investigate any relationships between classroom environmental conditions and disruptive behaviour. Based on these data, an intervention was formulated to help reduce the disruptive behaviour. This intervention was reported to be successful and was rated highly by both the student and the student's teacher (Hoff et al., 2005). Use of strategies for learning for students with ADHD must be an ongoing and dynamic process in order to foster success (Barkley, 1998; Robin, 1998; Tannock, 2008).

It is important for teachers to provide instructional support for students with ADHD in their classrooms (Stormont, 2008). Gureasko-Moore, DuPaul, and White (2006) found that self-management strategies were successful in enhancing class preparation for secondary school students with ADHD, and that teachers did not perceive any negative side effects of these interventions. Curtis et al. (2006) and Pisecco, Huzinec, and Curtis (2001) assessed teachers' perceptions of classroom interventions for students with ADHD, and teachers' acceptability of classroom-based behavioural strategies for ADHD respectively. Pisecco et al. found that teachers thought daily report cards were more acceptable, effective, and quicker to implement than various other strategies including medication. Curtis et al. compared groups of teachers practicing in the United States and in New Zealand, and found that the latter group considered medication (as an intervention) to be significantly less acceptable than their American counterparts.

Furthermore, Stormont and Stebbins (2005) found that teachers at the preschool level did not feel that they knew a lot about assessing ADHD in preschool students, and that teachers' ratings of their own knowledge of ADHD were not associated with performance on the test questions assigned by the researchers. Wheeler, Pumfrey, and

Wakefield (2009) investigated the variability of ADHD symptoms in a primary school context, and identified approaches that could be useful for teachers to possibly reduce ADHD-like behaviours in the classroom. Vance and Weyandt (2008) however found that there were no significant differences in perceptions about ADHD knowledge or college/university students with ADHD among college/university professors of differing levels or education, years of teaching experience, previous experience with students with ADHD, or training in ADHD. Nowacek and Mamlin (2007), in addition, investigated implementation of academic and behavioural modifications for students with ADHD among four elementary school teachers. Nowacek et al. found that few modifications were provided, and that the nature of the modifications was questionable as to appropriateness and/or effectiveness with regard to applicability.

Teacher Training and Professional Development in ADHD

Even though ADHD causes impairment for students in classrooms, several studies have found that teachers receive little ADHD training (Jones & Chronis-Tuscano, 2008). Teacher training in ADHD is important as misconceptions among teachers are significant and professional development has been shown to significantly increase teachers' knowledge (West et al., 2005). Jerome et al. (1994) surveyed Canadian and American teachers and found that both groups felt that there was little to no opportunity to learn about ADHD, either during programs of teacher education, or after graduation. Jerome et al. concur with the findings of Sciutto et al. (2000) in that there are positive relationships between teachers' amount of experience with students with ADHD and teachers' knowledge of ADHD. Vereb and DiPerna (2004) disagree that such relationships are evident; however, Vereb and DiPerna do conclude that teachers' participation in ADHD

training is positively correlated with teachers' knowledge of ADHD, as well as teachers' acceptability of behaviour management strategies; including medication. Sciotto et al. also recommend that teacher education should focus more on characteristics of ADHD beyond the primary symptoms as specified in the DSM IV TR (APA, 2000). In addition, Zentall and Javorsky (2007) found that in-service education improved teachers' attitudes, confidence in teaching, and self-reported ability to provide accommodations. Jones and Chronis-Tuscano (2008) also found that in-service training resulted in increased knowledge about ADHD and an increased use of behaviour modification techniques among special education teachers.

The Role of the Teacher: What Is It? What Should It Be?

Barkley (1990, as cited in Sciotto et al., 2000), with reference to adults involved with students with ADHD, states that "Teachers are an important part of this multidisciplinary team" (p. 1). In terms of the role of the teacher, greater attention should be paid to how teachers contribute to the process and content of consultation with regard to students with ADHD (Erchul et al., 2007) as teachers are often the primary source of referral for these students (Sciotto et al., as cited in Sherman et al., 2008). Jerome et al. (1994) found that clinicians were not making routine use of teachers' ratings to assess the needs of students with ADHD, but did make more use of more subjective parent reports. Given the "multi-modal treatment plan" (p. 566) involving teachers as well as outside professionals, Jerome et al. found it concerning that only 14% of teachers reported having contact with outside professionals. Jerome et al. also noted that doctors' monitoring of students with ADHD rarely involves teachers. Miranda, Jarque, and Tarraga (2006) mention that the best interventions for students with ADHD are of a multi-modal type,

which would include not only teachers and outside professionals (Jerome et al., 1994) but specifically parent training, school and child-based interventions, and medication as well.

Graham (2008) asks why doctors (specifically pediatricians) do not get involved or engaged with pertinent issues in the field of education such as asking for lower class sizes, or more funding, and what the impacts on learning and behaviour of students with ADHD may be as a result of this involvement/engagement. Graham (2008) also raises the issue of the possible importance of teachers having to educate doctors about important and pertinent issues in the field of education. Furthermore, Efron et al. (2008) found that parents of students with ADHD perceive that teachers have inadequate understanding, and schools insufficient resources, to support their children's special needs. In addition, Efron et al. found that 83% of parents polled believed that class sizes were too large to adequately support students with ADHD. The above section represents mainly a North American perspective; however, Graham (2008) and Efron et al. represent an Australian perspective, and Miranda et al. (2006) represent a Spanish perspective.

Current Policy Situation

There is no current legislative policy in Ontario for recognition of ADHD as an exceptionality (OME, 2001, 2009). It is possible to identify a student with ADHD as exceptional; however, this would have to be done on a case-by-case basis, and would only be possible if the student's relevant issues could be framed within current legislative means for identification (e.g., *learning disabled* or *behavioural*). School boards do not identify students with ADHD as exceptional, since they are following Ministry policy. The closest thing that there seems to be to even an unofficial recognition of ADHD-like symptoms as exceptional is a model Individualized Education Plan (IEP) provided online

by the Council of Ontario Directors of Education (2009). This initiative along with other studies relating to an increased recognition of symptoms indicative of ADHD, like this study, may lead to an increased awareness of symptoms and how to deal with them effectively. Like Ontario, neither the U.S., nor Australia, nor other Canadian provinces such as British Columbia and Alberta recognize ADHD as a category of exceptionality in itself. According to Australian policy, funding is available for those affected by certain ADHD-like symptoms, who meet certain criteria, even though ADHD is not considered to be a specific exceptionality (Graham, 2007, p. 590). In short, experts in Ontario and elsewhere emphasize that strategies to effectively deal with ADHD in the classroom are specifically needed (Tannock, 2008), but there has been no policy change, even for unofficial recognition of ADHD-like symptoms, by school boards in Ontario; not even to frame ADHD-like symptoms within the current legislative means for identification of exceptionalities.

Ontario and Other Canadian Provinces

Current categories of exceptionality in Ontario include Behaviour, Communication (autism, deaf/hard of hearing, language impairments, speech impairments, learning disabilities), Intellectual (gifted, mild intellectual disability, developmental disability), Physical (including blind/low vision), and Multiple (OME, 2001). Burge et al. (2008) emphasize the importance of considering public opinion when looking at policy, and have found that the public in Ontario are almost evenly divided on whether or not to support inclusive education or segregated schooling: “Understanding the views of the public is an important factor in developing and evaluating policy on inclusive education” (p. 16). This is an important consideration because Ministry special

education documentation in Ontario indicates inclusion to be the first option for consideration (Burge et al., 2008). The Ontario College of Teachers [OCT] “has recognized the need to enhance in-service training efforts with the intention of improving teacher preparedness in educating children with intellectual disabilities and other disabilities” (OCT, 2006, as cited in Burge et al., 2008, p. 18) and has recommended “regulatory adjustments: to adjust the content of the program of professional education to identify special education as a required component” (OCT, p. 101, as cited in Burge et al., 2008, p. 15).

Other Canadian provinces, such as Alberta and British Columbia for example, have policies and categories of exceptionalities similar to Ontario; however there are some differences. According to special education policy in Alberta, the categories of exceptionalities in this province include Physical, Behavioural (i.e., social/adaptive), Communicational, Cognitive/Intellectual, and Academic (Alberta Learning, 2004). Similarly, for British Columbia, these categories include Intellectual (mild/moderate to profound), Learning Disabilities (weaknesses in cognitive processing, including issues with executive functions and working memory), Gifted, Behavioural Needs or Mental Illness and Physically Dependent (deaf/blind, physical disability or chronic health impairments, visual impairments, deaf or hard of hearing, autism spectrum disorder) (BC Ministry of Education, 2016). With regard to behavioural needs or mental illness, British Columbia policy states that “Students identified in this category are most in need of intensive interventions. They are expected to be less than 1% of the student population province-wide” (BC Ministry of Education, 2016, p. 57). Furthermore, some of the criteria mentioned to receive these “intensive interventions” include antisocial or

extremely disruptive behaviours in most environments (e.g., classroom, school, family, community) and behaviours that are consistent and persistent over time (BC Ministry of Education, 2016). Literature specific to teaching students with ADHD in Alberta includes many resources that include information on understanding ADHD (emphasizing important terms such as inattention, hyperactivity, impulsivity, social-emotional difficulties, executive functions), home-school partnerships, approaches for managing ADHD, supportive classroom environments, and choosing instructional strategies, and tracking methods for teachers (Alberta Education, 2006). Alberta policy mentions that a multimodal approach is preferred to manage students with ADHD (Alberta Education, 2006), and British Columbia policy mentions the promotion of inclusion for students with ADHD (BC Ministry of Education, 2016).

American and International Perspectives

Spooner, Algozzine, Wood, and Hicks (2010) conclude that teacher education and special education practitioners should focus on stabilizing the concentration of research, enhancing evidence in the knowledge base, and establishing the standards that define professional practice. DuPaul and Weyandt (2006a) recommend that a school intervention plan should be balanced between proactive and reactive strategies. DuPaul and Weyandt (2006a) have found that the literature shows mostly reactive approaches to managing behaviour, and that little is known about the transition from high school to college and university for students with ADHD, and how best to support these students through this transition. In addition, Graham (2008) mentions the notion of focusing on integrating students into the system rather than changing the system itself. Furthermore, Prosser et al. (2002) found that 50% of individuals with ADHD in the United States

qualify for use of resources due to comorbidity, even though ADHD itself is recognized as a disability according to special education policy. Like Ontario and other Canadian provinces, neither the United States nor Australia has any ADHD-specific federal or state policies (Prosser et al., 2002). Improving educational interventions has been secondary to medical approaches in Australia over approximately the last 20 years, and when comparing the United Kingdom to both the United States and Australia, the United Kingdom favours psychological and educational interventions for inattention, impulsivity, and hyperactive behaviour, whereas Australia and the United States consider ADHD mainly a disability requiring medical intervention (Prosser et al., 2002).

ADHD as a Category of Exceptionality

Many feel that inclusion of ADHD as a disability category is the most useful change to special education policy that governments could make (Prosser et al., 2002). Others do not feel that including ADHD as a category of exceptionality would be nearly as useful (Prosser et al., 2002). Part of the debate revolves around the roles that teachers and doctors would play. Some critics of ADHD as a category would conclude that doctors may become proverbial gatekeepers of educational interventions (beyond medication) and that as a result, teachers may play a less important role (Prosser et al., 2002). The debate as to whether or not students must fit a certain label in order to access resources also exists: “It is not the absence of ADHD as a disability category that prevents effective intervention. Helpful techniques are potentially available without reworking existing legislative and policy definitions” (Prosser et al., 2002, p. 75). As is the case in Ontario, other Canadian provinces, and American jurisdictions, ADHD is not a recognized category in itself for disability funding anywhere in Australia (Efron et al.,

2008). In New Zealand, teachers have a non-categorical system, which may under-endorse medication for example compared to the United States (Curtis et al., 2006). The issue of funding is at the forefront of the debate for policy makers (Prosser et al., 2002). In Ontario, an amendment to the Education Act, Bill 82, emphasizes that students with disabilities have the right to receive an education at the expense of the public (Burge et al., 2008). This adds complexity to the debate regarding funding, and Diller (1998, as cited in Prosser et al., 2002) conceptualizes the debate by representing an ADHD category as one of either a proverbial light at the end of the tunnel, or an oncoming train. With funding as a central issue, there are several educational interventions that can be used to assist students with ADHD, and there are choices that need not be costly (Stormont, 2008). Furthermore, Ontario's Equity and Inclusive Education Strategy (OME, 2014) provides guidelines for policy development and implementation, which may serve to inform how ADHD is managed within the context of special education policy moving forward. In conclusion, it is important to note that the establishment of a category of exceptionality for ADHD may not directly lead to an increase in teachers' satisfaction with strategies, knowledge of ADHD, or familiarity with related policy or resources to better support students with ADHD. Implications relating to the importance of continuing to develop teachers' competencies in these areas are later discussed.

This chapter has outlined some of the key areas of literature that provide an important context, and justification for what is being explored through the research questions for this study. The review of literature on the nature of ADHD as a disorder helps to set the stage for exploring teachers' knowledge of ADHD. Similarly, the review of areas pertaining to strategies and professional development for teachers, and policy,

give a framework for the research questions explored in this study, as the data collected connects to teachers' levels of knowledge of ADHD, teachers' familiarity with related policy, and teachers' levels of satisfaction with strategies to successfully teach students with ADHD. The next chapter outlines the methodology for this study.

CHAPTER THREE: METHODOLOGY AND PROCEDURES

This chapter outlines the research design, and discusses how the data for this study has been collected, analyzed, and presented. The research objectives for this study include assessing teachers' knowledge of ADHD as well as levels of satisfaction and familiarity with handling students with ADHD. In addition, the absence or presence of statistically significant differences between each of knowledge, satisfaction, and familiarity among different groups of teachers are investigated. These groups of teachers vary according to the following factors: number of years teaching, experience with teaching special education classes, and teaching positions in the elementary versus secondary panels. Details relating to participants, instrumentation, limitations, and ethical considerations are also discussed in this chapter.

Research Methodology and Design

This study is quantitative in nature and took the form of a survey research design. "Survey research designs are procedures in quantitative research in which investigators administer a survey to a sample or to the entire population of people to describe the attitudes, opinions, behaviors or characteristics of the population" (Creswell, 2008, p. 388). Since the main objectives of this study involved looking at trends in the data regarding teachers' knowledge of ADHD, and levels of satisfaction and familiarity with handling students with this disorder, a survey research design directly served this purpose. By examining trends in the data, we can learn more about the sample of teachers surveyed, and possibly extend to other populations of teachers as well. Furthermore, by utilizing this design inferences can be made about the wider population using the data obtained (Kelley, Clark, Brown, & Sitzia, 2003) with the sample chosen ideally being

reflective of the larger population of teachers (Draugalis, Coons, & Plaza, 2008). This study primarily constituted of a cross-sectional survey research design (Creswell, 2008), as questionnaires collected from teachers at a particular moment in time provided the data for analysis. The questionnaire also posed questions, which were not directly related to the research questions, but rather were included to provide some indication of demographics for the participants.

Selection of Site and Participants

The participant sample for this study was derived from stratified random sampling. This type of sampling involves dividing the population on certain characteristics (e.g., elementary vs. secondary teachers) and then sampling from each sub-group using simple random sampling, which involves selecting participants such that each potential participant has an equal probability of being selected from the population (Creswell, 2008). In a large school board in Ontario, elementary and secondary schools were randomly selected from each of the three core regions of the school board. In order to select schools, schools were numbered, and through random number generation, schools were identified for selection by the assigned number. The school board's public website was used to assist in this process. The website included the names of each of the elementary and secondary schools in each of the three core regions of the school board. The public website also included information pertaining to the number of teaching staff present at each school. This information was used by the researcher to ensure that a sufficient number of schools had been selected to fill the quota of potential teacher participants.

Using convenience sampling the teacher participants from each school were invited to participate. Convenience sampling involves selection of participants because

they are willing and available to be studied (Creswell, 2008). An invitation by email was sent via the teachers' school board email accounts. Although all teachers at a selected school were invited to complete the survey, teachers within each school did so voluntarily. A total of 466 teachers were invited to participate in the survey (230 elementary teachers and 236 secondary teachers) from the random sample of five elementary and three secondary schools. All teachers at each of the randomly selected schools were invited to participate. A total of 87 teachers volunteered and completed the survey. This total consisted of 36 elementary teachers and 51 secondary teachers. This resulted in an overall response rate of 19%, with an elementary teacher response rate of 16%, and a secondary teacher response rate of 22%.

Among the total number of respondents, 68% were in the first half of their careers (0–14 years) and the remaining 32% were in the second half of their careers (15–30+ years). For statistical analyses, categories for years of experience were amalgamated to reflect teachers in the first half versus second half of their careers. Figure 1 shows the full distribution of years of experience as depicted in the survey data, while comparing elementary teachers with secondary teachers. Furthermore, 41% of respondents identified themselves as elementary teachers, and 59% identified themselves as secondary teachers. In addition, 28% of respondents identified themselves as special education teachers (currently teaching special education classes) with the remaining 72% identifying that they do not currently teach any special education classes. Some questions were incorporated into the survey for the purposes of gathering some additional data beyond the data required to investigate the specific research questions for this study. These survey questions allowed the researcher to gather some additional demographic

information (questions 4, 7, 8, 11, 12, and 26) and some additional opinion/perception-based information (questions 14, 15, 16, and 22) pertaining to the participants that could possibly be used for future analyses. This additional information is summarized in Tables 1 and 2 showing overall responses for each question.

The additional demographic and opinion/perception-based data can be helpful in shedding light on some of the specific background knowledge and experiences of the respondents. This information can be very useful in terms of implications for possible future research. For example, aspects of this specific profile may influence responses to survey questions (e.g., 43% of respondents have never taught any special education classes), and possibly how responses may change among groups of respondents with different overall profiles. This may also affect how responses to survey questions may be extrapolated to greater populations of teachers.

Instrumentation

A questionnaire was administered to participants that consisted of 45 questions pertaining to teachers' knowledge of ADHD, their levels of satisfaction, and familiarity with handling students with ADHD (Appendix A). The researcher assembled the survey instrument questions from existing and published surveys (Bouck, 2005; Jerome et al., 1994; Ohan et al., 2008). Permission from the authors was obtained via email correspondence. The survey questions required yes/no, true/false, and multiple choice responses comprising categorical data. For example, teacher respondents were asked to identify themselves in terms of their years of experience while answering the second question of the survey. This question gave teachers seven choices of year ranges: 0–4; 5–9; 10–14; 15–20; 21–25; 26–30; and 30+ years.

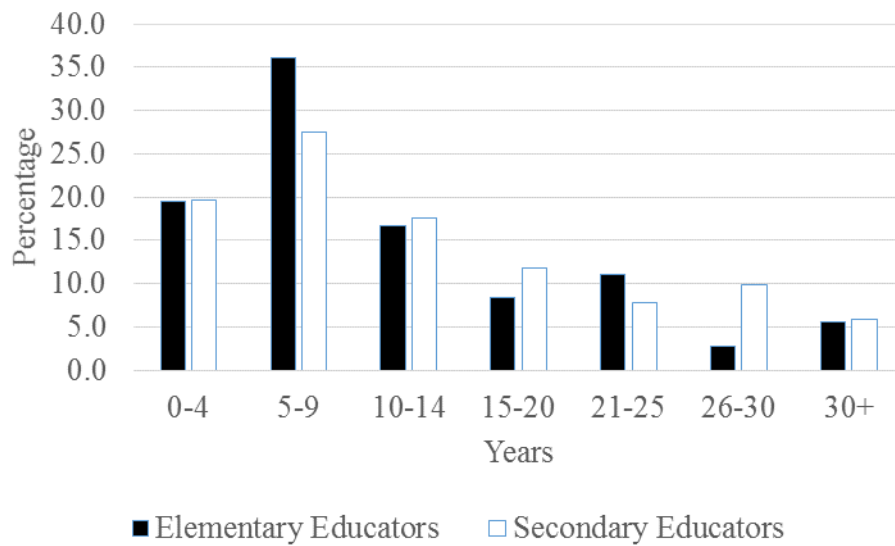


Figure 1. Reported years of teaching experience by elementary and secondary teachers.

Table 1

*Survey Question Items for the Purpose of Collecting Additional Data on Participants**(Yes/No Type Questions)*

Survey question no.	Frequency (%)	
	Yes	No
4. Do you currently hold qualifications to teach special education in Ontario?	47	53
7. Have you ever participated in any professional development focusing on students with ADHD?	38	62
8. To the best of <i>your</i> knowledge at this moment, have any of your colleagues with whom you work closely ever participated in any professional development focusing on students with ADHD?	46	54
11. Have you ever taught at least one student that you suspected might have ADHD?	99	1
12. Have you ever taught at least one student that you knew for a fact had been officially diagnosed with ADHD?	87	13
26. Have you had any professional development in special education within the last 2 years?	60	40

Table 2

*Survey Question Items for the Purpose of Collecting Additional Data on Participants**(Likert Scale Type Questions)*

Survey question no.	Frequency (%)				
	1	2	3	4	5
14. In your opinion, please rank your <i>colleagues'</i> perceived levels of knowledge of ADHD (on a scale from 1 to 5, with 5 being <i>highly knowledgeable</i> and 1 being <i>not at all knowledgeable</i>)	4	31	49	15	1
15. Please indicate <i>your</i> satisfaction with the following (on a scale from 1 to 5, with 5 being the <i>most satisfied</i> and 1 being the <i>least satisfied</i>): Special education programs at your school	7	15	29	34	15
16. Please indicate <i>your</i> satisfaction with the following (on a scale from 1 to 5, with 5 being the <i>most satisfied</i> and 1 being the <i>least satisfied</i>): <i>Your</i> pre-service preparation to prepare you to teach special education (if you have never taught any special education classes, please select "NA" for this question)*	17	18	7	10	5
22. Please rate <i>your</i> opinion of the <i>usefulness</i> of the following accommodations for a student with ADHD in your classroom (on a scale from 1 to 5, with 5 being <i>very useful</i> and 1 being <i>not at all useful</i>): More preparation time	11	20	25	38	7

*Note: For question 16, 43% of respondents selected "NA".

The survey questions requiring yes/no and true/false responses represent nominal, dichotomous scales, and categorical data were obtained for statistical analyses from these responses by having each category represented by a numerical value (e.g., yes = 1; no = 0). The survey questions featuring multiple choice responses, other than the yes/no and true/false responses as previously discussed, also represent a nominal scale. Among these multiple choice questions, nominal data (without order) were obtained from survey question numbers 1, 2, and 5, which asked about teaching panel, years of experience, and ADHD as an exceptionality respectively. Nominal data were obtained from all survey questions requiring respondents to use a Likert scale. Where individuals were asked to provide a rating, a 5-point Likert scale format was used. To ensure reliability and validity of this rating, and the wording through which this rating was explained to the participant, the scale and instructions were taken from Bouck (2005). To be conservative, the researcher chose to treat these data as categorical rather than interval in order to accommodate for low response rate and response bias. Being conservative in this regard would still allow for obtaining valid results, when computing statistical analyses for data sets representing a low response situation, where these data are not necessarily normally distributed (Creswell, 2008). This approach is further elaborated upon later in this chapter, and at the beginning of the next chapter with regard to testing for the presence or absence of statistically significant differences among groups using Chi-Square Tests of Independence.

Given the 5-point rating, 1 represents the lowest end of the scale, and 5 represents the highest end of the scale. For example, for a question asking to rate satisfaction, 1 indicates being “least satisfied” and 5 indicates being “most satisfied.” This applies to

questions 9, 10, and 13–25. Questions 27 through 45 were used to assess teachers' levels of knowledge of ADHD, and were taken from Ohan et al. (2008). Ohan et al. (2008) used these questions to reliably and validly assess teachers' levels of knowledge of ADHD in the aforementioned study (p. 440). These questions were originally designed by Jerome et al. (1994) as part of the ADHD Knowledge Scale. The survey was made available for teachers to complete over a 3-week period toward the end of their school year. Teachers were advised by the researcher that the estimated time for completion of the survey would be approximately 20 minutes. The actual duration of time taken of course would vary among participants. The survey administration concluded with a statement to thank the participating teacher for his/her time, and to inform the participant that their responses may be used to inform special education policy in the province of Ontario.

Instrument Validation

The questions assessing teachers' knowledge of ADHD were taken from the survey designed by Jerome et al. (1994) as depicted in Ohan et al. (2008). Ohan et al. (2008) used all knowledge questions, as presented in Jerome et al., with the exception of "ADHD [which] occurs more in minority groups than in Caucasian groups" (p. 439). This question was omitted due to an ethical concern that participants may believe this to be true (when in actuality it is false) without immediate feedback from the researchers (Ohan et al., 2008). Initial development of the survey used by Jerome et al. involved a review by teachers and special education directors to ensure that items were appropriate and inoffensive (Jerome et al., 1994). (Ohan et al., 2008) notes that the survey by Jerome et al. has been widely used in past studies, allowing for direct comparison of results to existing literature. The true/false knowledge scale is beneficial because it is brief, and

will therefore increase teacher participation, and as a result, the generalization of results to the larger population of teachers (Ohan et al., 2008). Furthermore, “unlike comparable knowledge scales, it has shown good validity (e.g., utility and sensitivity as a measurement of the impact of teacher education on knowledge)” (Ohan et al., 2008, p. 439).

The sections of the instrument for this study that ask for general information (for the purposes of grouping) and ratings using a 5-point Likert scale have been adapted from Bouck (2005), who derived the survey questions from Conderman and Katsiyannis (2002), a study that involved a statewide assessment of instructional issues and practices in secondary special education. Peers and established special education professionals provided feedback for additional survey questions fashioned by Bouck, and the draft survey was field tested by 10 secondary special education teachers to check for clarity of the questions, and to remove or revise any questions that were unclear, or that failed to gather the intended information (Bouck, 2005). In addition, the survey instrument for this study was reviewed by professors of education at the university level, and screened by both the external research committee for the school board that it was used in, and by a research ethics board at the university level.

Data Collection and Analyses

As previously mentioned, teachers received an invitation to complete the survey via their school board email. Contained within the email message was an invitation, confirmation of ethics approval, and a link to the survey. The survey was made accessible online and administered electronically to participants through SurveyMonkey. At the end of the survey administration period, the researcher downloaded and analyzed the survey results completed by all participants. The researcher was able to view the survey results

online by signing in to the above website with a username and password. In addition the researcher downloaded the survey results into SPSS (version 20) for analysis. The online software available through the survey administration website allowed for downloading of the survey response data into an SPSS compatible file, which could be opened in SPSS for analysis. After migrating the data set into SPSS the researcher reviewed the data set for accuracy, and to make sure that these data were accurately downloaded from the online forum so that the applicable categorical data sets could be analyzed in SPSS, and that the appropriate tests for statistical significance could be carried out.

Both descriptive statistics and inferential statistics (Creswell, 2008) were used to analyze the quantitative data. Use of non-parametric statistical tests available through SPSS version 20 allowed the researcher to describe trends in the data in response to the research questions for this study. The three independent variables used for these analyses included years of experience, general versus special education teachers, and teaching panel (elementary vs. secondary teachers). Each of these independent variables were cross-tabulated with the responses for each survey question pertaining to teachers' satisfaction, knowledge, and familiarity. Each of these survey questions represented a different dependent variable, and these questions were organized into three clusters. "Satisfaction" included survey questions 17–21 and 23–25; "knowledge" included survey questions 5, 13, and 27–45; and "familiarity" included questions 6, 9, and 10. The responses for each of the survey questions within each cluster were independently run with each of the three independent variables as depicted in the research questions for this study.

Cross-tabulations were computed for each of these comparisons, and Chi-Square Tests of Independence (Zibran, 2007) were run for each of the above comparisons to test

for any statistically significant relationships among the variables. Due to sample size and the nature of questions resulting in large contingency tables (i.e., questions incorporating 5-point Likert scales), Pearson Chi-Square analyses of cross-tabulations with all seven ranges for years of teaching experience revealed a very high percentage of cells with a below minimum expected count (< 5), which considerably affected validity of p values for assessment of significant relationships. To accommodate for this issue, categories were collapsed and statistical analyses were performed and considered using two ranges for years of experience (0–14 and 15–30+) rather than the original seven ranges. This allowed for accurate assessment for significant relationships considering teachers in the first half (0–14 years) of their career versus teachers in the second half (15–30+ years) of their career, assuming that an average full career is approximately 30 years. These comparisons align with the research questions for this study, as presented earlier. Furthermore, to better reflect the conservative approach elected by the researcher to treat Likert scale data as categorical as described above, Likert scale categories were amalgamated when carrying out Chi-Square Tests of Independence. This approach to better reflect Likert scale data as categorical and hence to increase accuracy of results when computing Chi-Square Tests of Independence is further modeled at the beginning of the next chapter (Creswell, 2008; Dolnicar, Grun, Leisch, & Rossiter, 2011).

Limitations

There are limitations inherent in the research design of this study based on the instrument and the fact that participating teachers are volunteers. For example, the instrument included items in a true/false format for the knowledge component questions; this format may yield disproportionate results given the 50% probability of selecting the

correct response for each knowledge component. Teachers may have different experiences with and perspectives about ADHD than those teachers electing not to participate (Vereb & DiPerna, 2004). In addition, teachers from different regions may have differing experiences with and/or attitudes toward students with ADHD based on individual classroom experiences and/or possible variations in classroom dynamics from school to school. Furthermore, qualifications and years of experience may influence the results. If the large majority of participants are highly qualified and experienced, they may be more likely to have more knowledge (Vereb & DiPerna, 2004). Finally, the overall response rate of 19% is limiting in terms of how many teachers out of the invited pool elected to respond, and this in turn may limit the generalizability of the results to the larger population of Ontario teachers. Attempts were made to mitigate for this by conducting the research in a core region of one of the largest and most diverse school boards in the province.

Ethical Considerations

Research involving human participants and educational research must be vetted through the appropriate screening procedures. For this research study, ethical approval was obtained from both the school board within which the research took place, and also by the Brock University Research Ethics Board (file #09-273-Bennett). Copies of approval letters were provided for reference to all participants upon invitation to participate. A letter of feedback summarizing the results of this study is available through the school board's office of the external research screening committee. Instructions on how to access this research study are also available through this office. The next chapter presents the results of this study.

CHAPTER FOUR: PRESENTATION OF RESULTS

Collection of data for this study involved culling responses to survey questions from teachers in a large school board in Ontario. Survey questions were designed to assess teachers' familiarity with special education policy, knowledge of ADHD, and levels of satisfaction with strategies available to them to support students with ADHD in their classrooms. Both descriptive and inferential statistics were used to analyze these data. As part of the main objectives of this study, statistically significant associations were explored among variables such as teachers' years of experience, teachers of special education versus non-special education classes, and elementary versus secondary teachers with questions pertaining to each of satisfaction, knowledge, and familiarity as described above. The following sections present the results of this study, beginning with an extension of the methodology for statistical analyses described in the previous chapter, and a reiteration of the research questions for this study.

As described previously, cross-tabulations were computed between the three independent variables (years of experience, special education vs. non-special education teacher, and elementary vs. secondary teacher) and the survey questions previously outlined (representing the dependent variables) comprising each of the "knowledge," "satisfaction," and "familiarity" clusters. Cross-tabulations for each of survey questions 6, 9, and 10 (representing three dependent variables) within the familiarity cluster, with each of the three independent variables, are modeled below in Tables 3 through 12. Tables 3 through 6 illustrate comparisons of teachers in the first half of their career versus teachers in the second half of their career (independent variable) with each other

in terms of familiarity with the DSM, special education policy at the school board level, and special education policy at the Ministry level (dependent variables). Tables 7 through 9 similarly compare special education to non-special education teachers, and Tables 10 through 12 similarly compare elementary teachers to secondary teachers. Expected counts are included in brackets with each observed count. These statistics were obtained using SPSS version 20. Table 5 models how the Likert scale categories 1–3 and 4–5 were collapsed into “some familiarity” and “familiar,” respectively, for the purposes of conducting Chi-Square Tests of Independence as described in the previous chapter.

Cross-tabulations as modeled above for the “familiarity” cluster were similarly computed for the “satisfaction” and “knowledge” clusters, as described above. Likert scale data were similarly amalgamated as depicted in Table 5 where applicable for the purposes of conducting Chi-Square Tests of Independence. For example, where respondents rated levels of satisfaction on a 5-point Likert scale, categories 1–3 were combined and identified as having “some satisfaction” and categories 4–5 were combined and identified as being “satisfied.” In order to determine whether there is a significant association between the dependent variables within these clusters and the independent variables, Chi-Square Tests of Independence were performed as previously noted. These analyses were used to test for associations between responses and participants grouped by their answers to certain survey questions, which correspond to the research questions for this study requiring testing for associations between the independent and dependent variables discussed above.

Table 3

Familiarity With DSM vs. Years of Experience

No. of years	Responses		Totals
	Yes	No	
0–14	19 (18.3)	40 (40.7)	59
15–30+	8 (8.7)	20 (19.3)	28
Totals:	27	60	87

Table 4

Level of Familiarity With School Board Special Education Policy vs. Years of Experience

No. of years	Level of familiarity					Totals
	1	2	3	4	5	
0–14	11 (9.4)	14 (14.2)	15 (15.5)	13 (13.5)	5 (5.4)	58
15–30+	3 (4.6)	7 (6.8)	8 (7.5)	7 (6.5)	3 (2.6)	28
Totals:	14	21	23	20	8	86

Table 5

*Level of Familiarity With School Board Special Education Policy vs. Years of Experience**(Showing Amalgamated Categories for Computing Chi-Square Tests of Independence)*

No. of years	Level of familiarity		Totals
	Some familiarity	Familiar	
0–14	40 (39.1)	18 (18.9)	58
15–30+	18 (18.9)	10 (9.1)	28
Totals:	58	28	86

Table 6

Level of Familiarity With Ministry Special Education Policy vs. Years of Experience

No. of years	Level of familiarity					Totals
	1	2	3	4	5	
0–14	13 (12.2)	12 (12.9)	21 (19.7)	9 (10.2)	4 (4.1)	59
15–30+	5 (5.8)	7 (6.1)	8 (9.3)	6 (4.8)	2 (1.9)	28
Totals:	18	19	29	15	6	87

Table 7

Familiarity With DSM vs. Special Education and Non-Special Education Teachers

Teacher category	Familiarity (yes/no)		Totals
	Yes	No	
Special Education	10 (7.5)	14 (16.5)	24
Non-Special Education	17 (19.5)	45 (42.5)	62
Totals:	27	59	86

Table 8

Level of Familiarity With School Board Special Education Policy vs. Special Education and Non-Special Education Teachers

Teacher category	Level of familiarity					Totals
	1	2	3	4	5	
Special Education	2 (4.0)	3 (5.9)	5 (6.5)	8 (5.4)	6 (2.3)	24
Non-Special Education	12 (10.0)	18 (15.1)	18 (16.5)	11 (13.6)	2 (5.7)	61
Totals:	14	21	23	19	8	85

Table 9

Level of Familiarity With Ministry Special Education Policy vs. Special Education and Non-Special Education Teachers

Teacher category	Level of familiarity					Totals
	1	2	3	4	5	
Special Education	3 (5.0)	2 (5.3)	6 (7.8)	9 (4.2)	4 (1.7)	24
Non-Special Education	15 (13.0)	17 (13.7)	22 (20.2)	6 (10.8)	2 (4.3)	62
Totals:	18	19	28	15	6	86

Table 10

Familiarity With DSM vs. Teaching Panel

Teacher category	Familiarity (yes/no)		Totals
	Yes	No	
Elementary	12 (11.2)	24 (24.8)	36
Secondary	15 (15.8)	36 (35.2)	51
Totals:	27	60	87

Table 11

Level of Familiarity With School Board Special Education Policy vs. Teaching Panel

Teacher category	Level of familiarity					Totals
	1	2	3	4	5	
Elementary	5 (5.7)	6 (8.5)	8 (9.4)	13 (8.1)	3 (3.3)	35
Secondary	9 (8.3)	15 (12.5)	15 (13.6)	7 (11.9)	5 (4.7)	51
Totals:	14	21	23	20	6	86

Table 12

Level of Familiarity with Ministry Special Education Policy vs. Teaching Panel

Teacher category	Level of familiarity					Totals
	1	2	3	4	5	
Elementary	5 (7.4)	7 (7.9)	13 (12.0)	8 (6.2)	3 (2.5)	36
Secondary	13 (10.6)	12 (11.1)	16 (17.0)	7 (8.8)	3 (3.5)	51
Totals:	18	19	29	15	6	87

These specific research questions (with null hypotheses in brackets) are reiterated below:

- Is there a relationship between years of experience and satisfaction with means to deal with ADHD in the classroom, knowledge of the disorder, or familiarity with special education policy/resources? [There is no relationship between years of experience and satisfaction with means to deal with ADHD in the classroom, knowledge of the disorder, or familiarity with special education policy/resources.]
- Are there any significant differences between general teachers and those teachers that report that they teach special education classes in terms of satisfaction with means to deal with ADHD in the classroom, knowledge of the disorder, or familiarity with special education policy/resources? [There are no significant differences between general teachers and those teachers that report that they teach special education classes in terms of satisfaction with means to deal with ADHD in the classroom, knowledge of the disorder, or familiarity with special education policy/resources.]
- Do significant differences exist between elementary and secondary teachers in the reporting of levels of satisfaction with available (or perceived available) strategies, knowledge of the disorder, or familiarity with current policy? [No significant differences exist between elementary and secondary teachers in the reporting of levels of satisfaction with available (or perceived available) strategies, knowledge of the disorder, or familiarity with current policy.]

Teachers' Satisfaction With Strategies to Support Students With ADHD

Survey questions asking teachers to rate their levels of satisfaction with strategies available to them to deal with ADHD in the classroom took the form of a 5-point Likert scale, with 1 indicating the least satisfaction, and 5 indicating the most satisfaction. A total

of eight survey questions comprised this cluster, pertaining to teachers' levels of satisfaction, and the results are summarized in Table 13.

Teachers were generally quite dissatisfied with their pre-service preparation to help them teach students with ADHD in their classrooms, with 39.8% of teachers selecting 1 on the Likert scale, and only 3.6% selecting 5. Results were comparable for levels of satisfaction with in-service strategies to teach students with ADHD, with less emphasis on the most dissatisfied selection on the scale. When asked to rate satisfaction with strategies to teach students with ADHD provided at the school level, 75.7% of respondents indicated a level of satisfaction of 1, 2, or 3 on the Likert scale. Similarly with regard to strategies at the school board level, 86.0% of respondents answered within the above range, and 93.1% of respondents answered within this range when asked about strategies at the Ministry level.

Teachers were also asked to evaluate the usefulness of various strategies to accommodate students with ADHD in their classrooms with four survey questions (questions 21, 23, 24, and 25 as depicted in Table 13). The same type of 5-point Likert scale was used to report these ratings. When asked about their opinions of the usefulness of more appropriate curricula, 39.5% of teachers selected the neutral response of 3, 18.6% selected 4, and 5.8% selected 5. Teachers rated preparation time to be more useful overall with 24.7% selecting 3, 37.6% selecting 4, and 7.1% selecting 5. Teachers also found the remaining strategies for accommodation generally more useful. When asked about in-service training in classroom management 19.8% of teachers selected the neutral response of 3, 34.9% selected 4, and 27.9% selected 5. With regard to in-service training in instructional methods, 17.4% of teachers selected 3, 41.9% selected 4, and 27.9% selected 5. Finally, when asked about the usefulness of improving collaboration with colleagues to help accommodate students with ADHD in the classroom, 27.4% of teachers selected 3, 35.7% selected 4, and 20.2% selected 5.

Table 13

Likert Scale Type Survey Question Items Pertaining to Teachers' Levels of Satisfaction

Survey question no.	Frequency (%)				
	1	2	3	4	5
17. Please indicate <i>your</i> satisfaction with the following (on a scale from 1 to 5, with 5 being the <i>most satisfied</i> and 1 being the <i>least satisfied</i>): <i>Your</i> pre-service preparation to prepare you to teach students with ADHD	39.8	32.5	20.5	3.6	3.6
18. Please rate <i>your</i> satisfaction with the <i>availability</i> of the following (on a scale from 1 to 5, with 5 being the <i>most satisfied</i> and 1 being the <i>least satisfied</i>): Strategies for teachers to deal with ADHD students provided at the school level	16.3	36.1	23.3	14.0	10.5
19. Please rate <i>your</i> satisfaction with the <i>availability</i> of the following (on a scale from 1 to 5, with 5 being the <i>most satisfied</i> and 1 being the <i>least satisfied</i>): Strategies for teachers to deal with ADHD students provided by your School Board	26.7	38.4	20.9	10.5	3.5
20. Please rate <i>your</i> satisfaction with the <i>availability</i> of the following (on a scale from 1 to 5, with 5 being the <i>most satisfied</i> and 1 being the <i>least satisfied</i>): Strategies for teachers to deal with ADHD students provided by the Ministry (Ontario)	32.6	37.2	23.3	3.5	3.5
21. Please rate <i>your</i> opinion of the <i>usefulness</i> of the following accommodations for a student with ADHD in your classroom (on a scale from 1 to 5, with 5 being <i>very useful</i> and 1 being <i>not at all useful</i>): More appropriate curricula	15.1	20.9	39.5	18.6	5.8
23. Please rate <i>your</i> opinion of the <i>usefulness</i> of the following accommodations for a student with ADHD in your classroom (on a scale from 1 to 5, with 5 being <i>very useful</i> and 1 being <i>not at all useful</i>): In-service training in classroom management	4.7	12.8	19.8	34.9	27.9
24. Please rate <i>your</i> opinion of the <i>usefulness</i> of the following accommodations for a student with ADHD in your classroom (on a scale from 1 to 5, with 5 being <i>very useful</i> and 1 being <i>not at all useful</i>): In-service training in instructional methods	3.5	9.3	17.4	41.9	27.9
25. Please rate <i>your</i> opinion of the <i>usefulness</i> of the following accommodations for a student with ADHD in your classroom (on a scale from 1 to 5, with 5 being <i>very useful</i> and 1 being <i>not at all useful</i>): Improved collaboration with colleagues	8.3	8.3	27.4	35.7	20.2

Teachers' Knowledge of ADHD

Teachers were asked to state their opinion of the status of ADHD as currently recognized exceptionalism by the Ontario Ministry of Education. Furthermore, teachers were asked to rate their own perceived knowledge of the disorder using a 5-point Likert scale. In terms of rating ADHD as an exceptionalism, 40.2% of teachers believed that ADHD is currently recognized as an exceptionalism, 34.5% believed that the disorder is not currently recognized as an exceptionalism, and 25.3% stated that they were uncertain whether or not ADHD is currently recognized as an exceptionalism by the Ontario Ministry of Education. In terms of ranking their own perceived knowledge of ADHD, 3.5% of teachers selected 1 on the 5-point Likert scale, to indicate minimally perceived knowledge, 22.1% selected 2, 43.0% selected 3, 23.3% selected 4, and 8.1% selected 5, to indicate maximally perceived knowledge.

Nineteen survey questions (adapted from Jerome et al., 1994; Ohan et al., 2008) were used to assess teachers' knowledge of ADHD (Table 14). For the majority of the 19 knowledge-based questions, teachers' answers indicated confidence in their understanding of ADHD. For all of these 19 questions (except question 41) the correct answer was selected by the majority of respondents (see Table 14 for frequencies of correct and incorrect responses for each question). Overall, for the majority of these 19 knowledge-based questions, over 80% of teacher respondents selected the correct answer; however, there were five questions where this was not the case. As shown in Table 14, the questions that were answered correctly by less than 80% of the teacher respondents included questions 28, 36, 37, 41, and 43.

Table 14

Likert Scale Type Survey Question Items Pertaining to Teachers' Levels of Satisfaction

Survey question no.	Frequency (%)	
	True	False
27. ADHD can be caused by poor parenting practices	17.2	82.8*
28. ADHD can often be caused by sugar or food additives	29.9	70.1*
29. ADHD girls/boys are born with biological vulnerabilities toward inattention and poor self control	81.4*	12.6
30. A girl/boy can be appropriately labeled as ADHD and not necessarily be over-active	87.4*	12.6
31. ADHD girls/boys always need a quiet, sterile environment in order to concentrate on tasks	14.9	85.1*
32. ADHD girls/boys misbehave primarily because they don't want to follow rules and complete assignments	2.3	97.7*
33. The inattention of girls/boys with ADHD is not primarily a consequence of defiance, oppositionality, and an unwillingness to please others	81.6*	18.4
34. ADHD is a medical disorder that can only be treated with medication	18.4	81.6*
35. ADHD girls/boys could do better if they only would try harder	12.6	87.4*
36. Most ADHD girls/boys girls/boys outgrow their disorder and are normal as adults	27.6	72.4*
37. ADHD can be inherited	63.5*	36.5
38. ADHD is extremely rare in girls/boys	10.5	89.5*
39. If medication is prescribed, educational interventions are often unnecessary	9.3	90.7*
40. If a girl/boy can get excellent grades one day and awful grades the next, then he/she must not have ADHD	4.7	95.3*
41. Diets are usually not helpful in treating most girls/boys with ADHD	16.1*	83.9
42. If a girl/boy can play Nintendo for hours, she/he probably isn't ADHD	4.6	95.4*
43. ADHD girls/boys have a high risk for becoming delinquent as teenagers	51.7*	48.3
44. ADHD girls/boys are typically better behaved in 1-to-1 interactions than in a group situation	87.4*	12.6
45. ADHD often results from a chaotic, dysfunctional family life	15.1	84.9*

* Indicates correct response.

To address the remaining objectives of this study, each of the independent variables of years of experience, type of classes taught (special education vs. non special education), and panel (elementary vs. secondary) were cross-tabulated with survey questions pertaining to each of teachers' satisfaction with strategies to handle ADHD in the classroom (questions 17–21 and 23–25), teachers' knowledge of ADHD (questions 5, 13, and 27–45), and teachers' familiarity with special education policy/resources (questions 6, 9, and 10). Statistical analyses (Chi-Square Test of Independence) were performed to see whether the proportions of the independent variables are different among the values of the dependent variables. These results are summarized, and statistically significant findings are outlined in the following sections.

Teachers' Years of Experience

A Chi-Square Test of Independence, performed to examine the relationship between years of experience and knowledge, revealed a significant difference between teachers in the first half of their career versus teachers in the second half of their career regarding their answers to survey question 28—"ADHD can often be caused by sugar or food additives"— $\chi^2 (1, N = 87) = 7.973, p = 0.005 < 0.05$. Results implied a greater knowledge of sugar and food additives in relation to ADHD among teachers in the first half of their career (0–14 years of experience) with 79.7% of these teachers selecting the correct answer (false) for the above survey question versus 50.0% of teachers in the second half of their career (15–30+ years of experience) selecting the correct answer. Significant differences were not observed between teachers with 0–14 years of experience and teachers with 15–30+ years of experience for cross-tabulations between survey questions pertaining to teachers' satisfaction with strategies to manage ADHD, or those questions pertaining to teachers' familiarity with special education policy/resources.

Teachers of Special Education Classes vs. Teachers of Non-Special Education Classes

Statistically significant differences between teachers of special education classes versus teachers of non-special education classes were discovered among all three sets of survey questions including those pertaining to satisfaction, knowledge, and familiarity.

Satisfaction with Strategies to Manage ADHD

A Chi-Square Test of Independence, performed to examine the relationship between type of classes taught and satisfaction, revealed a significant difference between teachers of special education classes versus teachers of non-special education classes for survey question 19, which asked teachers to rate their satisfaction with strategies available to them at the school board level to manage ADHD in their classrooms, $X^2(1, N = 87) = 7.815, p = 0.005 < 0.05$. Results implied a greater satisfaction with strategies available at the school board level to manage ADHD in the classroom among teachers of special education classes versus teachers of non-special education classes; 31.1% of teachers of non-special education classes chose the most dissatisfied selection of 1 on the 5-point Likert scale for this particular survey question, compared to 16.7% of teachers of special education classes making this selection. Similarly for example, 3.3% of teachers of non-special education classes selected 4 for this same question compared to 25.0% of teachers of special education classes making this selection.

Knowledge of ADHD

A Chi-Square Test of Independence, performed to examine the relationship between type of classes taught and knowledge, revealed a significant difference between teachers of special education classes versus teachers of non-special education classes for

survey question 13, which asked teachers to rate their own perceived levels of knowledge of ADHD, $X^2(2, N = 87) = 9.402, p = 0.009 < 0.05$. Results implied a higher rating of one's own perceived knowledge of ADHD among teachers of special education classes versus teachers of non-special education classes; 30.6% of teachers of non-special education classes chose 2 on the 5-point Likert scale for this particular survey question, compared to no teachers (0%) of special education classes making this selection. Similarly for example, 1.6% of teachers of non-special education classes chose the highest ranking of 5 for this same question compared to 26.1% of teachers of special education classes making this selection.

Familiarity With Special Education Policy/Resources

Firstly, a Chi-Square Test of Independence, performed to examine the relationship between type of classes taught and familiarity, revealed a significant difference between teachers of special education classes versus teachers of non-special education classes for survey question 9, which asked teachers to rate their familiarity with special education policy at the school board level, $X^2(1, N = 87) = 10.891, p = 0.001 < 0.05$. Results implied a greater familiarity with special education policy at the school board level among teachers of special education classes versus teachers of non-special education classes; 29.5% of teachers of non-special education classes selected 2 on the 5-point Likert scale for this particular survey question, compared to 12.5% of teachers of special education classes making this selection. Similarly for example, 3.3% of teachers of non-special education classes selected the highest indication of familiarity 5 for this same question compared to 25.0% of teachers of special education classes making this selection.

Secondly, a Chi-Square Test of Independence, performed to examine the relationship between type of classes taught and familiarity, revealed a significant difference between teachers of special education classes versus teachers of non-special education classes for survey question 10, which asked teachers to rate their familiarity with special education policy at the Ministry (Ontario) level, $X^2 (1, N = 87) = 15.962$, $p = 0.000 < 0.05$. Results implied a greater familiarity with special education policy at the Ministry (Ontario) level among teachers of special education classes versus teachers of non-special education classes. 27.4% of teachers of non-special education classes selected 2 on the 5-point Likert scale for this particular survey question, compared to 8.3% of teachers of special education classes making this selection. Similarly for example, 9.7% of teachers of non-special education classes selected 4 for this same question compared to 37.5% of teachers of special education classes making this selection.

Elementary vs. Secondary Teachers

Statistically significant differences between elementary and secondary teachers were discovered among survey questions pertaining to familiarity and knowledge.

Familiarity With Special Education Policy/Resources

A Chi-Square Test of Independence, performed to examine the relationship between teaching panel and familiarity, revealed a significant difference between elementary and secondary teachers for survey question 9, which asked teachers to rate their familiarity with special education policy at the school board level, $X^2 (1, N = 87) = 4.652$, $p = 0.031 < 0.05$. Results implied a greater familiarity with special education policy at the school board level among elementary teachers compared to secondary

teachers; 67.2% of secondary teachers indicated some or no familiarity compared with only 32.8% of elementary teachers representing this selection.

Knowledge of ADHD

A Chi-Square Test of Independence, performed to examine the relationship between teaching panel and knowledge, revealed a significant difference between elementary teachers and secondary teachers for survey question 45—“ADHD often results from a chaotic, dysfunctional family life”— $X^2(1, N = 87) = 4.066, p = 0.044 < 0.05$. Results implied a greater knowledge of this fallacy among elementary teachers with 94.3% of these teachers selecting the correct answer (false) for the above survey question versus 74.8% of secondary teachers selecting the correct answer.

Summary of Results

This chapter has outlined survey responses pertaining to teachers' satisfaction with strategies to support students with ADHD, knowledge of the disorder, and familiarity with related resources and policy. Significant associations were explored between teachers' years of experience, type of classes taught, and panel with each cluster of survey questions relating to satisfaction, knowledge, and familiarity. Some statistically significant associations were discovered. Results suggest that teacher respondents are generally dissatisfied with their abilities to support students with ADHD in the classroom, and see value in acquiring strategies to improve this situation. Although teacher respondents seem generally knowledgeable about ADHD as a disorder, many are unfamiliar with related resources and policy implications. Teachers of special education classes were noticeably more familiar with related resources and policy compared to teachers of non-special education classes, and seemed more comfortable with supporting

students with ADHD than their aforementioned counterparts. Teachers of special education classes were also more knowledgeable about certain aspects of ADHD compared to teachers of non-special education classes.

CHAPTER FIVE: SUMMARY, DISCUSSION, AND IMPLICATIONS

The goals of this study were to assess teachers' levels of satisfaction with available strategies to support students with ADHD in the classroom, knowledge of the disorder, and familiarity with related special education policy/resources. These three aspects were examined over the whole sample of teachers, and through comparisons of teachers' years of experience, if teachers taught special education classes, and placement in either the elementary or secondary panel. The findings of this study have extended upon existing literature and have the potential to contribute to existing theory and practice regarding ADHD in the classroom.

Discussion and Implications

The following discussion addresses the key ideas related to the findings of this study: teachers' satisfaction with strategies to manage ADHD; teachers' knowledge of ADHD; and teachers' familiarity with special education policy/resources.

Teachers' Satisfaction With Strategies to Manage ADHD

The results of this study suggest that teachers are generally dissatisfied with their pre-service preparation to prepare them to teach students with ADHD in their classrooms, and were comparably dissatisfied with their in-service training to provide strategies to teach students with ADHD in their classrooms. Furthermore, when comparing teachers of special education classes with teachers of non-special education classes, it was found that teachers that taught special education classes were more satisfied with strategies provided at the school board level to manage ADHD in the classroom, compared to teachers who did not teach special education classes.

The importance of building relationships seems to be a common theme in terms of what can be put in place to help increase teachers' satisfaction with successfully dealing with ADHD symptoms among students. Different studies have shown the importance of a variety of relationships to achieve this goal of increased satisfaction among teachers. Bergin and Bergin (2009) emphasize the importance of developing teacher–student relationships in helping teachers to successfully teach students with ADHD due to increasing the feeling of attachment between parties such as the teacher and the student, and the student and the school. As an extension of these useful relationships, successful interventions can be formulated. This could involve professional collaboration among teachers to initiate and maintain interventions geared toward behaviour management, instructional modification, and/or communication between the school and home during the school-age years for youngsters with ADHD (DuPaul, Weyandt, & Janusis, 2011). Harrison, Vannest, and Reynolds (2011) emphasize that in order to maximize success in this regard, a holistic approach to interventions, such as considering both home life and school life for students is necessary. Knowles (2010) further emphasizes that the building of relationships supersedes other interventions, including looking at modifying curriculum, instruction, or assessment. The importance of respect and having teachers and students believe in each other is noted to be paramount. In addition, having parents engaged with the management of ADHD symptoms along with teachers and students themselves is important (Levine & Anshel, 2011). Nadeem and Jensen (2009) mention that few school-based interventions specifically target the needs of students with ADHD and that teacher consultation is a promising approach to support the academic success of students with ADHD.

Since this study indicated that teachers were largely dissatisfied with availability or perceived availability of successful instructional strategies for students with ADHD, increasing awareness of successful strategies for teachers may be an important step forward. Schultz, Storer, Watabe, Sadler, and Evans (2011) extend upon these ideas to note that several school-based interventions have shown promise. These promising interventions need to involve teachers using effective strategies on a regular basis, both at the elementary and secondary levels, and be evidence-based interventions that involve specific cognitive and behavioural strategies for specific students (Schultz et al., 2011). Kuriyan et al. (2013) outline a longitudinal study tracking young adults with and without childhood diagnoses of ADHD symptoms. Comparisons of achievement, education, and occupational attainment between these two groups suggest the need for interventions for children with ADHD. Similarly Pfiffner, Villodas, Kaiser, Rooney, and McBurnett (2013) show the importance of school-based interventions when tracking achievement and success of elementary aged children of diverse ethnic backgrounds. Early interventions are important in helping students with ADHD to be successful in schools and in increasing teachers' satisfaction with teaching students with ADHD. Schneider, Gerdes, Haack, and Lawton (2013) extend that not only are early interventions important in this regard, but also in order to maintain interventions so that families do not discontinue such treatments later on due to the onset of various pressures that may arise.

This study found that teachers were largely dissatisfied with the level of their overall ability to successfully teach students with ADHD in terms of strategies to be used. In order to increase teachers' satisfaction with teaching students with ADHD, teachers need to be using successful strategies in schools, which will lead to success for these

students. Several studies have outlined successful strategies that can be utilized by schools and teachers in the classroom to increase achievement of students with ADHD, and hence the levels of satisfaction with the overall ability to successfully teach these students, among their teachers.

As issues with executive functions and working memory propagate inattention, interventions involving these important processes have been suggested as strategies to help teachers successfully manage ADHD in the classroom. Working memory training does help students with ADHD to improve results in school (Chacko et al., 2014). Cognitive strategy instruction involving providing students with strategies to structure stages of mental processing when completing a task (Iseman & Naglieri, 2011) can also be used to help improve results, such as math scores, among students with ADHD. Johnson and Reid (2011) emphasize that in order for students with ADHD to improve academic performance, any executive function related difficulties or deficits must be overcome. Beck, Hanson, Puffenburger, Benninger, and Benninger (2010) support that working memory training leads to improved symptoms, organization, and inattention (heightened attention) among students with ADHD. Fowler (2010) reinforces that interventions themselves are not a cure for ADHD, and that in order to minimize off-task performance, the use of strategies needs to be monitored, and adjustments to these strategies and/or the application of strategies need to be made as required in order to best help students.

In contrast to academic achievement, Fabiano et al. (2010) outline use of a daily report card for students with ADHD. This initiative was reported to have no significant improvements in achievement, symptoms, or student–teacher relationships; however, it

was reported to positively affect functioning in the classroom, attainment of IEP goals, teacher ratings of academic productivity, and behaviour for students with ADHD in classrooms. Vujnovic, Fabiano, Pariseau, and Naylor (2013) however claim that the daily report card is a sustainable intervention, providing that behavioural support is also in place. Jurbergs, Palcic, and Kelley (2010) concur that daily report cards are effective in improving behaviour among certain students with ADHD, where effectiveness of this strategy in promoting improved academic performance is not as clear. Sprafkin, Mattison, Gadow, Schneider, and Lavigne (2011) found behaviour monitoring via teacher rating scales to be both reliable and valid.

In addition, many specific monitoring practices have shown promise. These included both student-centered and teacher-centered monitoring strategies. Geng (2011) found that some effective verbal and nonverbal strategies included voice control, use of short phrases, repeated instructions, use of students' names, and combining visual cues with verbal instructions. Verbal strategies used by teachers were found to be very helpful in dealing with inattention, and non-verbal strategies were found to be more useful in terms of classroom management. Graham-Day, Gardner, and Hsin (2010) found that on-task behaviour was improved for high school students with ADHD using auditory signals as well as student checklists. Self-monitoring (both with and without reinforcement) was also deemed to be effective. Hoff and Ervin (2013) also noted that self-management intervention lead to a decrease in disruptive behaviour among children with ADHD.

Furthermore, Wu and Gau (2013) concluded that early efforts to implement interventions to deal with childhood inattention may offset related problems in school during late childhood and adolescence for students with ADHD. Schottelkorb and Ray

(2009) state that child-centered play therapy showed a reduction in some ADHD symptoms, and Fowler (2010) notes that adding interest and meaning can help to focus attention. Many of the above strategies deal specifically with improving working memory and executive function, as much research has examined working memory and executive functions in relation to ADHD. Although other neurologically based treatments and interventions do exist and are offered, not all are well supported (Willis, Weyandt, Lubiner, & Schubart, 2011). In conclusion, there are several varied approaches and strategies that can be implemented to help teachers deal more successfully with students with ADHD in the classroom. By incorporation of successful strategies such as those depicted above, teachers' levels of satisfaction with means to deal with ADHD in the classroom will naturally show improvement.

Teachers' Knowledge of ADHD

Among the teachers surveyed, this study found that ADHD as a disorder was reasonably well understood overall. For the majority of the knowledge-based survey questions the above finding was apparent, and results were largely comparable to prior studies in established literature such as Jerome et al. (1994) and Ohan et al. (2008). Most of the knowledge-based survey questions were answered correctly by at least 80% of respondents. ADHD in relation to current special education policy seemed to be an area of confusion for the teacher respondents participating in this study. Just over 40% of respondents believed that ADHD is currently recognized as an exceptionality according to Ministry and school board policies in Ontario, and just over 25% of respondents were uncertain whether or not ADHD is currently recognized as an exceptionality. As indicated previously in Table 14, survey questions 28, 36, 37, 41, and 43 were answered

correctly by less than 80% of the teacher respondents. This may imply areas of need in terms of teacher training and will be elaborated upon in the next section. Teachers of special education classes had a higher perception of their own knowledge of ADHD compared to teachers of non-special education classes. Teachers of special education classes also demonstrated a greater understanding of age and diets in relation to ADHD. Furthermore, fewer elementary teachers than secondary teachers believed the falsehood that a dysfunctional family life, as depicted in survey question 45, can cause ADHD. In addition, it is noteworthy to mention that a significant difference between teachers in the first half of their careers and teachers in the second half of their careers was found when comparing responses to survey question 28, indicating a greater knowledge of sugar and food additives in relation to ADHD symptoms among teachers in the first half of their careers. This may imply a further area of need in terms of training for later-career teachers.

In comparison, when considering experience in special education compared to years of overall experience, Bell, Long, Garvan, and Bussing (2011) found that certification in special education contributed to ADHD-related stigma perceptions among teachers, whereas years of teaching experience did not. Ohan, Visser, Strain, and Allen (2011) worked with a sample of 34 Canadian elementary teachers and 32 teacher education students, examining case studies of students both with and without ADHD. Ohan et al. (2011) found that teachers and education students alike perceived more impairment, and experienced negative emotions, less confidence, and an increased willingness to implement interventions for the students with the ADHD diagnosis label, and training specific to ADHD predicted less bias toward the ADHD label while

experience working with students with ADHD did not similarly indicate less of a label bias. Furthermore, the teachers viewed behaviour as less disruptive but were more bothered by behavioural issues and were more inclined to implement interventions compared to the group of education students. Teachers compared to education students were also more inclined to implement strategies for boys more so than girls. In addition, Rinn and Nelson (2009) found that pre-service teachers tended to think of behaviours indicative of ADHD from a pathological standpoint, and did not independently consider other possible explanations for these behaviours, such as giftedness. Wood (2012) concurs that a greater understanding of this kind of differential display of ADHD is needed, particularly among gifted students. Regardless of specific manifestations, Schottelkorb and Ray (2009) emphasize that ADHD is the most common diagnosis of childhood. It is therefore important not only for teachers but for additional school personnel as well, for example counselors, to be aware of specific interventions to reduce symptoms indicative of ADHD that negatively impact student learning.

In addition to elaboration through a North American lens, the results of this study outlining teachers' knowledge of ADHD can also be compared with some international perspectives, as previously introduced. Anderson, Watt, and Noble (2012) found that Australian in-service teachers showed more overall knowledge of ADHD, its characteristics, and treatments compared to pre-service teachers without teaching experience. There were no reportable differences found between these groups in terms of knowledge of causes of the disorder, overall attitudes, stereotypes, or beliefs about teaching children with ADHD. McMahon (2012) adds that Australian pre-service teachers were reluctant to consider ADHD as a label for a child, compared to established

literature, and perhaps less certain of what this label may mean for a child. Oh et al. (2010) discovered that prior teaching experience in teaching students with disabilities made pre-service teachers from China, Korea, and the United States feel more competent to teach these students. These pre-service teachers were also more aware of factors under their control that influence their abilities to successfully teach these students. From a South African point of view, Seabi (2010) described ADHD as being most diagnosed, most misunderstood, and most misdiagnosed. Teachers in a South African private school were found to have a limited understanding of the nature and causes of ADHD, and felt medication to be a preferred intervention.

It is likely that training would improve understanding, which may imply continued areas for research and practice. Several of the aforementioned studies have shown correlations between some sort of training and increased knowledge, mainly from a North American perspective, which is the focus of this study. Syed and Hussein (2010) mention that training did improve female teachers' knowledge of ADHD; in this case by studying teachers in Pakistan. Finally it is important to note that it is to the benefit of students with ADHD for teachers to be knowledgeable about the disorder, so as to better instruct these students in their classrooms. Tymms and Merrell (2011) emphasize that students with ADHD typically do not do as well in school as others without the disorder, predominately if manifesting the inattentive type. Tymms and Merrell also suggest that the impulsive type may be positive for cognitive engagement, and put into question whether or not impulsivity in fact negatively affects learning. It is also noted that this notion may require alteration of current DSM criteria such as the act of blurting out answers. This may imply a need for continued research in this area. Within the scope of

this research study, the discussion has focused on teachers' satisfaction and knowledge, and will now look at familiarity and remaining implications.

Teachers' Familiarity with Special Education Policy/Resources

In terms of familiarity with special education policy, this study found that there were in fact significant differences between teachers of special education classes and teachers of non-special education classes. Results indicated a greater familiarity with special education policy at both the board and Ministry (Ontario) levels among teachers of special education classes compared to teachers of non-special education classes. This result may also imply an area of need in terms of training for teachers not involved with teaching special education classes. Similarly, secondary teachers were less familiar with special education policy at the school board level than elementary teachers, which may imply an area of need in terms of further training for secondary teachers. Many variables may come into play when examining how familiar teachers actually are with special education policy, the nature of ADHD, and/or available resources. The more familiar teachers are with these aspects certainly contributes to their abilities to successfully teach students with ADHD. Understanding the nature of the disorder in particular would certainly help teachers to allocate appropriate resources and strategies toward facilitation of effective instructional practices in order to successfully instruct students with ADHD. Furthermore, increasing teachers' familiarity with the nature of ADHD may assist in appropriate selection of instructional resources, and hence familiarity with available resources.

Alloway, Gathercole, and Elliott (2010) note that low working memory leads to low academic achievement in students with ADHD, and Kofler et al. (2011) add that

social problems are a prevalent feature and a major source of functional impairment for these students, with working memory deficits contributing to this impairment at least indirectly. Chaban (2010a) describes ADHD as a chronic neurological disorder that is not formally recognized in Canadian educational systems, and hence with little sharing of information and/or collaboration between the medical, research, and education communities. Wu and Gau (2013) similarly note that ADHD is associated with underachievement and school dysfunction. Although many of these issues are concerns for educators, and even though these symptoms compromise student learning, students with ADHD often do not receive access to special education services (Schultz et al., 2011).

Sanchez, Velarde, and Britton (2011) concur that students with ADHD are likely unidentified, even with the presence of psychological, and/or special education-related assessments. Findings also confirm that these students are not receiving optimal interventions, and that ADHD is often overlooked in some cultures. For example, among school children in Panama, prevalence of ADHD is low compared to neighboring countries (Sanchez et al., 2011). Levine and Anshel (2011) also show that children with ADHD are at an increased risk of failing in school, and developing social difficulties and/or psychiatric comorbidities. With regards to male high school students with ADHD, Kent et al. (2011) found that these students had lower grade point averages, lower class placement, and higher course failure rates than their counterparts without ADHD. Furthermore, both Normand, Flora, Toplak, and Tannock (2012) and Toplak et al. (2012) discuss the effectiveness of hierarchical factor models of ADHD symptoms. Hierarchical models were found to be more effective than correlational models (Normand et al., 2012) in terms of providing a better fit for ADHD symptoms, and were found to work across

multicultural and multinational groups, as well as various age groups (Toplak et al., 2012). This may imply an area for development in terms of teacher training, which will be elaborated upon in the next section, in order to help teachers become more familiar with ADHD, and hence policies, resources, and strategies that may be helpful in improving the quality of instruction and learning for students with ADHD in classrooms.

Further Implications for Professional Development

Implications for various forms of teacher training may be the most important overall focus in order to address the possible areas of need as indicated through the examination of the results of this research study. Martinussen, Tannock, and Chaban (2011) found that the majority of general education teachers and just under half of special education teachers reported brief or no in-service training in ADHD, and that general education teachers with more training reported significantly greater use of recommended approaches. As opinions differ among teachers at different points in their careers, timing of training may also represent an area for continued focus. Anderson et al. (2012) concluded that in-service teachers found teaching children with ADHD emotionally less favourable than pre-service teachers, and Bain, Brown, and Jordan (2009) found that teacher candidates tended to endorse the accuracy of certain ADHD interventions with minimal background information about these interventions and/or their effectiveness. Bain et al. go on to emphasize the importance of critical evaluation training for teacher candidates, and to be cognizant of possible misinformation passed on to parents by practicing teachers. Chaban (2010a) emphasizes that since ADHD is not formally identified, little information is taught to new teachers, and information gained by experienced teachers may not be useful and/or practical and/or may be out of date.

Chaban (2010a) also notes that research has shown that when teachers are provided with ADHD training that is comprehensive and evidence-based, teachers are more confident in teaching students with ADHD, and teachers use more effective approaches to instruction. As discussed earlier, Rosemary Tannock's *Teach ADHD* is an example of such a training intervention (Chaban, 2010a; Tannock, 2008, 2013).

An important part of a successful training regimen for teachers would undoubtedly include honing teachers' abilities to detect and manage ADHD symptoms and related issues among their students, and to be proactive in dealing with such issues. Teachers' initiatives can also be completed in cooperation with parents, which are of course key stakeholders as well. Alloway et al. (2010) suggest that subsequent learning problems for students with ADHD can be prevented by early detection of issues by teachers with some expertise to assist in the detection process. Harrison et al. (2011) add that when examining discriminating behaviours in children with ADHD, parents reported hyperactivity as the most discriminating of these behaviours. Teachers on the other hand reported learning problems, for adolescents in this case, to be more discriminating. It is also noted that with a holistic approach to interventions, including both the school and the home, students' academic and behavioural needs, both at school and at home, can be better understood, interpreted, and addressed.

Proactive monitoring by teachers would have to involve important flags. These may include turning in of assignments, living up to one's potential, absences and/or punctuality, and dropout rates, which Kent et al. (2011) found to be eight times more likely for male high school students with ADHD than their counterparts in a sample from Pittsburgh, PA. Chaban (2010b) states the opinion that a 100% graduation rate for

students with ADHD is possible since much is known of how to help these students overcome hindering cognitive processing difficulties, providing that researchers consider the education culture, and that teachers incorporate new knowledge as part of their practice. For example, knowledge of working memory training would be very useful and helpful for teachers to have, and this training is promising in order to improve executive function, and to reduce symptoms that hinder learning in students with ADHD (Beck et al., 2010). Such training would have to focus on key impairments to learning, and may also involve additional school personnel playing critical roles in student learning (Levine & Anshel, 2011).

Furthermore, Fabiano et al. (2013) studied diverse populations throughout the United States and found that current methods for identifying children with ADHD were only accurate for about 50% of students, with this figure being worse in more disadvantaged schools. It was suggested that such methods should be directly linked with knowledge and strategies for teachers. This indicates a further need for a variety of teacher training initiatives to accommodate teachers in school systems at various stages of competence with teaching students with ADHD, and particularly in systems where there are no initiatives or little research relating to teacher training programs (Syed & Hussein, 2010). Bigham, Daley, Hastings, and Jones (2013) add that practical implications must include multiple sources of information in order to assist with ADHD diagnoses. The aforementioned studies reinforce and reiterate the importance of teacher training, whereby teachers are better able to teach students with ADHD in their classrooms. In the context of this research study, the literature supports the importance of increasing teachers' knowledge of ADHD, familiarity with the nature of the disorder,

resources, and policies, and satisfaction with use of strategies. Professional development can be geared toward refining both theory and practice in these key areas as discussed above in order to help teachers improve learning for students with ADHD.

Summary and Conclusion

This study has provided a snapshot of teachers' knowledge of ADHD, satisfaction with means to address the disorder in the classroom, and familiarity with related resources and policy. The sample of teachers surveyed was taken from one of the largest public school boards in Ontario. This study found that teachers were generally dissatisfied with their abilities to teach students with ADHD. Special education teachers, as defined previously, did seem to have some advantages over non-special education teachers. Special education teachers were more satisfied with their abilities to use successful strategies to teach students with ADHD compared to non-special education teachers. Special education teachers were also more familiar with related resources and policies compared to non-special education teachers. Finally, special education teachers did seem to have more working knowledge of ADHD as a disorder on some knowledge-based questions, again compared to non-special education teachers. Knowledge-based questions that were answered correctly by less than 80% of respondents may indicate possible areas of deficiency in teachers' knowledge of ADHD. These areas included sugar and food additives, whether or not ADHD can be outgrown, inheritance of genes, diets, and risk of delinquency for teenagers. Teachers were least accurate with their answers to the questions that were posed to them regarding these areas, and the majority of respondents believed the falsehood that diets could be used as a treatment for ADHD. In the particular sample of teachers polled for this study, fewer teachers in the first half of

their careers believed this falsehood compared to teachers in the second half of their careers. The above areas may represent common gaps among the broader population for teacher training initiatives to address, as specific areas of need.

There are however limitations to this study. Further to the limitations previously discussed, there are some additional limitations that are noteworthy when considering the implications of the present study. Although specific groups of teachers were compared—such as special education and non-special education teachers, elementary and secondary teachers, and teachers with various years of experience—varied experiences, training, and/or knowledge of each individual naturally come into play, which influence individual responses among teachers in the same group. For example, among teachers surveyed for this study, 47% of teachers reported that they currently held qualifications to teach special education in Ontario; however, 43% of teachers reported never having taught any special education classes. For the purposes of this study, as described earlier, special education teachers were defined as teachers teaching special education classes, and not solely by qualifications to do so. This discrepancy shows how training initiatives would have to take experience into account as well as qualifications.

In addition, among the teachers polled for this study, 38% reported ever participating in professional development focusing on students with ADHD, whereas 99% reported ever teaching at least one student suspected to have ADHD, and 87% reported ever teaching at least one student officially diagnosed with ADHD. Furthermore, only 60% of teachers polled reported having any professional development in special education within the last 5 years at the time of completing the survey questionnaire for this study. In conclusion, there are certainly some useful findings that can be taken from

this study to inform continuing developments, particularly in terms of training initiatives, despite the limitations discussed. We can see that areas for training development could include strategies for teachers to teach students with ADHD, knowledge of the disorder, and exposure to related resources and policies. Related developments may also include further investigating advantages to successfully teaching students with ADHD indicative of experiences common to teachers in certain groups. Within the context of this study, these groups would involve special education versus non-special education teachers, elementary versus secondary teachers, and teachers of varying years of experience. In contribution to related literature, this study has shed some light on the direction that research and practice can take to help teachers improve learning for students with ADHD, and further emphasizes the continued need for ADHD-related training for teachers (Barkley, 1998; Tannock, 2008, 2013).

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Appendix A

Teacher Survey

Directions: For each question please answer by selecting from the available options.

- 1) Please identify yourself as either an elementary or secondary teacher according to your *current* teaching assignment.

Elementary Secondary

- 2) How many years of teaching experience do you have?

0-4 5-9 10-14 15-20 21-25 26-30 30+

- 3) Do you currently teach any special education *classes*?

Yes No

- 4) Do you currently hold qualifications to teach special education in Ontario?

Yes No

- 5) Attention-Deficit/Hyperactivity Disorder (ADHD) is currently recognized as an exceptionality according to Ministry policy in Ontario.

True False I don't know

- 6) Have you ever been presented with, or obtained through your own initiative, information about ADHD as outlined in the *current* Diagnostic and Statistical Manual of Mental Disorders published by the American Psychiatric Association?

Yes No

- 7) Have you ever participated in any professional development focusing on students with ADHD?

Yes No

- 8) To the best of *your* knowledge at this moment, have any of your colleagues with whom you work closely ever participated in any professional development focusing on students with ADHD?

Yes No

- 9) How familiar are you with your School Boards' special education policy documentation? (on a scale from 1 to 5, with 5 being *very familiar* and 1 being *not at all familiar*):

1 2 3 4 5

- 10) How familiar are you with the Ministry's (Ontario) special education policy documentation? (on a scale from 1 to 5, with 5 being *very familiar* and 1 being *not at all familiar*):

1 2 3 4 5

- 11) Have you ever taught at least one student that you suspected might have ADHD?

Yes No

- 12) Have you ever taught at least one student that you knew for a fact had been officially diagnosed with ADHD?

Yes No

- 13) Please rank *your* perceived level of knowledge of ADHD (on a scale from 1 to 5, with 5 being *I am highly knowledgeable* and 1 being *I am not at all knowledgeable*):

1 2 3 4 5

- 14) In your opinion, please rank your *colleagues'* perceived levels of knowledge of ADHD (on a scale from 1 to 5, with 5 being *highly knowledgeable* and 1 being *not at all knowledgeable*):

1 2 3 4 5

Please indicate *your* satisfaction with the following (on a scale from 1 to 5, with 5 being the *most satisfied* and 1 being the *least satisfied*):

15) Special education programs at your school

1 2 3 4 5

16) *Your* pre-service preparation to prepare you to teach special education (if you have never taught any special education *classes*, please select “NA” for this question)

1 2 3 4 5 NA

17) *Your* pre-service preparation to prepare you to teach students with ADHD

1 2 3 4 5

Please rate *your* satisfaction with the *availability* of the following (on a scale from 1 to 5, with 5 being the *most satisfied* and 1 being the *least satisfied*):

18) Strategies for teachers to deal with ADHD students provided at the school level

1 2 3 4 5

19) Strategies for teachers to deal with ADHD students provided by your School Board

1 2 3 4 5

20) Strategies for teachers to deal with ADHD students provided by the Ministry (Ontario)

1 2 3 4 5

Please rate *your* opinion of the *usefulness* of the following accommodations for a student with ADHD in your classroom (on a scale from 1 to 5, with 5 being *very useful* and 1 being *not at all useful*):

21) More appropriate curricula

1 2 3 4 5

22) More preparation time

1 2 3 4 5

23) In-service training in classroom management

1 2 3 4 5

24) In-service training in instructional methods

1 2 3 4 5

25) Improved collaboration with colleagues

1 2 3 4 5

26) Have you had any professional development in special education within the last 2 years?

Yes No

Please answer the following by selecting either *true* or *false*. Please answer all questions. If you are uncertain of an answer, choose what you feel the answer would most likely be.

27) ADHD can be caused by poor parenting practices

True False

28) ADHD can often be caused by sugar or food additives

True False

29) ADHD girls/boys are born with biological vulnerabilities toward inattention and poor self control

True False

30) A girl/boy can be appropriately labeled as ADHD and not necessarily be over-active

True False

31) ADHD girls/boys always need a quiet, sterile environment in order to concentrate on tasks

True False

32) ADHD girls/boys misbehave primarily because they don't want to follow rules and complete assignments

True False

33) The inattention of girls/boys with ADHD is not primarily a consequence of defiance, oppositionality, and an unwillingness to please others

True False

34) ADHD is a medical disorder that can only be treated with medication

True False

35) ADHD girls/boys could do better if they only would try harder

True False

36) Most ADHD girls/boys outgrow their disorder and are normal as adults

True False

37) ADHD can be inherited

True False

38) ADHD is extremely rare in girls/boys

True False

39) If medication is prescribed, educational interventions are often unnecessary

True False

40) If a girl/boy can get excellent grades one day and awful grades the next, then he/she must not have ADHD

True False

41) Diets are usually not helpful in treating most girls/boys with ADHD

True False

42) If a girl/boy can play Nintendo for hours, she/he probably isn't ADHD

True False

43) ADHD girls/boys have a high risk for becoming delinquent as teenagers

True False

44) ADHD girls/boys are typically better behaved in 1-to-1 interactions than in a group situation

True False

45) ADHD often results from a chaotic, dysfunctional family life

True False

Thank you for taking the time to respond to this survey. As a colleague of yours, I appreciate your time. Your responses may be used to inform special education policy in Ontario, and possibly future directions for how to better accommodate for students with Attention-Deficit/Hyperactivity Disorder (ADHD) in our schools. Enjoy a well deserved summer!