

**ADHD, the Classroom and Music: A Case Study**

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By

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## **Abstract**

Students with Attention-Deficit/Hyperactivity Disorder (ADHD) are usually inattentive and disruptive in class, are at high risk for chronic academic achievement difficulties, and may develop problems in relationships with peers, parents, and teachers (DuPaul, Stoner, 2003). One of the primary goals of behavioural treatment for ADHD is to enable a student to develop adequate levels of self-control (Barkley, 1990; DuPaul & Stoner, 1994). Methods are needed in the classroom, which give the child or adolescent with ADHD, control over his or her condition and thus increased independence, more experiences with success, and increased resiliency. Listening to music has many therapeutic applications, including the development of cognitive skills such as attention and memory (Canadian Association for Music Therapy, 2006). Music is accessible to all teachers and students, and is an easy strategy to implement in classrooms. Yet, despite the knowledge that adolescents are active users of music media (North, Hargreaves, & O'Neill, 2000), little research on music and ADHD participants has been completed. Through the use of a single subject case study, the purpose of this study was to: look at the academic experience of one adolescent male diagnosed with ADHD; and to gain a better understanding of how music might positively affect his ability to self regulate and cope with the detrimental effects of ADHD during in-class seat work and when completing homework. Multiple interviews with one boy, his parents, and teachers across a 14-week period of time provided a primary source of data. Results indicated that the adolescent's experiences with listening to music during school and homework increased the time that he was able to attend and concentrate. Unexpected gains included an increase in his ability to recall information during exams, and an increase in motivation, positive attitude, and mood towards school work as a result of enjoying listening to his favourite music. However, the study also involved the unexpected and disheartening discovery of clashing and competing voices that perhaps ultimately rendered the boy's positive

experiences with music insignificant, given the louder rule-and-order school culture. The pragmatic realities of working within a school context will need to be considered and strategically addressed if students are to benefit from practices that help even though they may be unconventional and not fully understood.

## **Acknowledgements**

As I come to the end of this journey I am reminded of the saying, “nothing truly meaningful in life is ever easy.” I had heard it many times, but only now do I genuinely understand its significance. My perseverance has paid off; however, I could have never done it alone.

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And last, I would like to thank Derek for always being my soft place to land at the end of a stressful day.

## **Dedication**

I dedicate this work to all of the kids that annoy their family, friends, and teachers. Never lose your energy and excitement for life!

To my brother, who still cannot remember anything I say.

And lastly, to my iPod that provided me with countless hours of music, and kept me entertained and motivated throughout the entire writing of this thesis.

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## **CHAPTER 1: Introduction**

Looking back upon my teenage years, I am reminded of the evening routine that occurred in my home. Every night my mother would sit down with my brother at the kitchen island. It was there, under the hot, bright lights, and sitting on the tall wooden stools that the imminent struggle would commence. Through the years, the evening homework routine progressed to different environments, until, it finally settled on the carpet living room floor. The shag rug and the open space made it okay for my brother to flip, kick, roll, flail, and whine as much as his heart desired. Being from a small town, my mother fought for my brother's ADHD diagnosis. It was a relief to both her and his teachers; a way to breathe in new air and understand his erratic behaviour, along with having a diagnostic platform to demand the adaptations that he needed in class to allow him to succeed.

As my life progressed and I became an educator, I was faced with a boy very similar to my brother. He had an ADHD diagnosis and teachers knew of his condition; however, they did not understand the need to adapt the classroom environment and instruction for him. As a result, he was constantly in trouble. Being a rookie in the education field, I really grappled with how to respond to him. He was very loud, disruptive in class, extremely confrontational with myself and with the others in his class, and was completely unresponsive to me when I told him to be quiet or to get to work. I was at a loss as to what would work for him in the classroom.

My daily struggle with him continued until one afternoon, when he asked if he could bring his discman, a portable music-player, into class. He assured me that he would not bother me or his other classmates, and that he would finish his assignment in class. Thinking that these were empty promises, I allowed him to listen to his music as long as it was only during individual desk work, and that it was quiet enough that only he could hear it. To my surprise, he actually worked on his assignment throughout the whole class without any disruptions, and handed in the

assignment before the bell rang. It appeared to me that having the diversion of music allowed him to forget about all of the other distractions that had previously consumed his attention. At the time, it was enough that listening to music worked for him; however, I never lost interest in learning *how* and *why* it was effective.

In recent years, I have acquired a considerable amount of information about Attention Deficit Hyperactivity Disorder from readings and graduate studies. But, academic discussions rarely communicate the emotional impact associated with the day to day challenges of coping with ADHD (Smallwood, 1997). Students with ADHD are: (a) usually inattentive and disruptive in class; (b) at high risk for chronic academic achievement difficulties; and (c) likely to develop problems in relationships with peers, parents, and teachers (DuPaul & Stoner, 2003). One of the primary goals of behavioural treatment for ADHD is to enable a student to develop adequate levels of self-control (Barkley, 1990; DuPaul & Stoner, 2003). The most commonly used method to treat ADHD is medication (Brue & Oakland, 2002; Chen & Taylor, 2005; LeFever, Villers, & Morrow, 2002; National Institute of Mental Health [NIMH], 2004a; Thompson, 1996). Other effective ways to treat ADHD that may be seen as unconventional include neurofeedback or electroencephalogram biofeedback training, diet, homeopathy or essential fatty acid supplements (Brue & Oakland, 2002). Listening to music may be one such alternative intervention. Listening to music has many therapeutic applications, including aiding in developing cognitive skills such as attention and memory (Canadian Association for Music Therapy, 2006). Music is accessible to all teachers and students and is an easy strategy to implement in classrooms. Yet, little research has been done on music and ADHD participants, which is especially surprising given the knowledge that adolescents are active users of music media (North, Hargreaves, & O'Neill, 2000).

Looking back on my past experience with individuals diagnosed with ADHD, I am continually reminded as an educator and as a researcher, of the importance of finding unique and sometimes unconventional ways to deal with the unending urges, outbursts, and inattention that accompany ADHD. The purpose of this study was to: look at the academic experience of one adolescent male diagnosed with ADHD; and to gain a better understanding of how music might positively affect his ability to self regulate and cope with the detrimental effects of ADHD during in-class seat work and when completing homework.

The following chapters are organized as follows. Chapter Two includes a review of the literature on ADHD, its treatment, and how it manifests in the classroom as well as literature on the positive affects of music. Chapter Three focuses on method, describing the single case study research method, sources of data, data analysis and representation, ethical considerations and criteria for establishing quality. Findings are presented in Chapter Four and discussed in terms of the extant literature, limitations, implications for practice, and suggested future research in Chapter Five.

## CHAPTER 2: Review of Literature

In this chapter, I review literature in the areas of ADHD (e.g., diagnosis, incidence, etiology, treatment), ADHD in the classroom, and positive effects of music listening. These bodies of research inform and provide a theoretical rationale for the present study. The chapter concludes with a statement of the study's purpose and guiding research question.

### *ADHD*

Attention Deficit/Hyperactivity Disorder (ADHD) is a relatively new name for the syndrome that has received much attention over the last three decades. Previously called Attention Deficit Disorder (ADD), it was also referred to as hyperkinesis or minimal brain dysfunction (Howell, Huessy, & Hassuk, 1985). ADHD is recognized by the American Psychiatric Association (2000) as an Attention-Deficit and Disruptive Behaviour Disorder. This disorder describes a diverse group of children who have problems with attention, distractibility, and, in many cases, impulsivity and overactivity (Pfiffner, 1996). Symptoms must be present before the age of seven (APA, 2000). Age-inappropriate problems with attention, learning, impulse control, and (usually) hyperactivity characterize ADHD (Julien, 2005). The Diagnostic and Statistical Manual of Mental Disorders or DSM-IV-TR (American Psychiatric Association [APA], 2000) identifies three ADHD subtypes - predominantly inattentive, predominantly hyperactive-impulsive, or combined (see Appendix A). The combined subtype refers to children who meet symptom criteria for both inattention and hyperactivity-impulsivity.

ADHD is characterized by low frustration tolerance, temper, outbursts, stubbornness, excessive and frequent insistence of attention from others, mood lability, demoralization, dysphoria, rejection by peers, and poor self-esteem (APA, 2000). Typically symptoms include behaviours that all children display to some extent, such as 'often avoids, dislikes, or is reluctant to engage in tasks that require sustained mental effort, such as school work or home work'

(inattention), or ‘often has difficulty playing or engaging in leisure activities quietly’ (hyperactivity), or ‘often has difficult waiting in turn’ (impulsivity). Only in extreme cases, when at least six symptoms are displayed within one dimension (inattentive or hyperactive-impulsive) can ADHD be diagnosed (Durstun, 2003). Although there are three subtypes of ADHD currently recognized by the DSM-IV, eighty percent of the children that are diagnosed with this disorder display symptoms in all three domains (Buitelaar, 2002).

### *Diagnosis*

ADHD is diagnosed by primary care clinicians, giving special attention to assessing school performance and behaviour, family functioning, and adaptation (American Academy of Pediatrics [AAP], 2000). The most reliable diagnostic tool is the individual’s history as described by the child, parents, and teachers, and as observed (Sheehan, 1997; Thompson, 1996). The diagnosis usually requires several steps, including evaluation over two to three visits. To be diagnosed with ADHD, the child must: meet the DSM-IV criteria (see Appendix A); have evidence directly obtained from parents or caregivers regarding the core symptoms of ADHD in various settings, the age of onset, duration of symptoms, and degree of functional impairment; and, have evidence directly obtained from the classroom teacher (or other school professional) regarding the core symptoms of ADHD, the duration of symptoms, the degree of functional impairment, and coexisting conditions (AAP, 2000). Physicians should review any reports from a school-based multidisciplinary evaluation where they exist, which will include assessments from the teacher or other school-based professional (AAP, 2000). Rating scales are extremely helpful in documenting the individual profile of ADHD symptoms as well as assessing the response to treatments; however, they should not be used for diagnosis without careful clinical confirmation and elicitation of the other criteria necessary for diagnosis (Spencer, Biederman, & Mick, 2007). Although neuropsychological testing is not relied upon to diagnose ADHD, it may

serve to identify particular weaknesses within ADHD or specific learning disabilities co-occurring with ADHD (Barkley, 1998). Other diagnostic tests are not routinely indicated to establish the diagnosis of ADHD. A few older studies have indicated associations between blood lead levels and child behaviour symptoms, although most studies have not (AAP, 2000). Also, studies have shown no significant associations between abnormal thyroid hormone levels and the presence of ADHD. Although children with this disorder have higher rates of ADHD than other populations, they demonstrate other characteristics of that condition (AAP, 2000). Similarly, some brain imaging studies and electroencephalography have demonstrated variation in brain morphology comparing children with and without ADHD; however, these studies do not hold sufficient validity in order to diagnose (AAP, 2000).

#### *Specific Culture, Age, and Gender Features*

This disorder occurs in all cultures and is more frequent in males (2:1) than in females (9:1) (APA, 2000). One Canadian study, the Quebec Child Mental Health Survey (QCMHS), was conducted in 1992 on a representative sample of 2400 children and adolescents aged six to fourteen years from throughout Quebec (Breton et al., 1999; Valla et al., 1994). These child reports indicated a significantly higher rate of ADHD in boys than in girls, and for 9-11-year-old children, compared to 12-14 year olds (Breton et al., 1999; Valla et al., 1994).

#### *Prevalence*

ADHD is the most common psychological disorder of childhood (Julien, 2005). The DSM-IV-TR (APA, 2000) estimates the prevalence of ADHD to be between 3-7% in school aged children. This is consistent with epidemiological studies, which indicated approximately 3-7% of children in the United States can be diagnosed with ADHD (Barkley, 1998; Pastor and Reuben, 2002). Smelter, Rasch, Fleming, Nazos and Baranowski (1996) reported 3-5% of US students

(1.35 million – 2.25 million) are diagnosed with ADHD, which they considered to be of epidemic proportions.

In a Canadian review of general population studies of ADHD in school-age children, Scahill and Schwab-Stone (2000) reported the best prevalence estimate to range from 5-10%, based on the Quebec Child Mental Health Survey (Breton et al., 1999; Valla et al., 1994) and the Ontario Child Health Study (Offord et al., 1987; Offord, Boyle, & Racine, 1989; Szatmari, Offord, & Boyle, 1989). The Quebec study collected child, parent, and teacher interview data for 2,400 six to fourteen-year-old children. The Ontario study collected data on 2,674 four to sixteen year olds using child, parent, and teacher behaviour checklists. Both studies had approximately equal numbers of girls and boys.

#### *Co-morbidity of ADHD*

A remarkable incidence of co-morbidity or concomitant disease occurs in individuals with ADHD. As many as two-thirds of elementary school-age children with ADHD who are referred for clinical evaluation, have at least one other diagnosable psychiatric disorder (Julien, 2005). Concomitant diseases include conduct disorder, oppositional defiant disorder, learning disorders, anxiety disorders, mood disorders (especially depression), and substance abuse. In adults, ADHD is associated with a tenfold increase of antisocial personality disorder, up to a fivefold increased risk of drug abuse, a twenty-fivefold increase in risk for institutionalization for delinquency, and up to a ninefold increased risk for incarceration (Julien, 2005).

#### *Persistence of ADHD into Adolescence and Adulthood*

For decades, ADHD has been seen primarily as a behaviour disorder affecting only young children, causing them to be inattentive and disruptive in school (Kordon, Kahl, & Wahl, 2006). However, when attention impairments are present in childhood, with or without hyperactivity, they tend to persist into adolescence and adulthood, often in ways that create problems for

individuals at school, at work and in social relationships (Biederman et al., 1998). The negative consequences of impulsivity can be greater for adults than for children as an impaired self control and a short fuse can cause aggressive behaviour, dangerous driving, etc. Adults with ADHD can also be impulsive buyers, and report more often about short-lived romances and marriages (Trott, 2006).

### *Etiology*

ADHD is not merely a lack of will power on the part of those who have difficulty staying focused on and completing tasks (Brown, 2005). Neither do social environmental factors such as parenting styles or teaching strategies play causal roles (Pfiffner, 1996) or dietary factors such as sugar consumption (Pfiffner, 1996). Rather, the primary cause is hereditary although environmental factors, such as fetal exposure to alcohol, drugs, and tobacco, perinatal complications, or head trauma, can play a role in the etiology of ADHD (Durstun, 2003).

*Genetics.* Quantitative genetic research over the last decade, from family, twin and adoption studies has firmly established that ADHD has a significant genetic contribution (Thapar, Holmes, Poulton & Harrington, 1999). ADHD has been found to be more common in first degree biological relatives (i.e., parents and siblings) (APA, 2000; Durston, 2003). Most family studies that have been conducted have identified a two to eightfold increase in the risk for ADHD in parents of children with ADHD (Biederman, 2005). Siblings of children with ADHD have a three to fivefold increase in the risk of developing the disorder, and the risk is even greater for monozygote twins, with 50 to 80% concordance compared with up to 33% in dizygotic twins (Durstun, 2003). Attention to comorbid psychiatric disorders in family studies also provides evidence for the genetic heterogeneity of ADHD (Biederman, 2005). Children with ADHD frequently have mothers with mood disorder, anxiety disorder, and stimulant/cocaine dependence and fathers with a history of childhood disruptive behavioural disorder (Julien, 2005).

Because ADHD is believed to be biologically based, twin studies have frequently been used to establish the degree to which this disorder is influenced by genetic factors. Biederman (2005) looked at numerous twin studies that were conducted between 1973 and 2002, and found that the mean heritability for ADHD was shown to be .77. Twin studies indicate that ADHD has a strong genetic component, with additive genetic effects explaining up to 80% of the variance of the underlying susceptibility (Durstun, 2003).

Given that ADHD is a neurodevelopmental disorder, genes involved in neuronal development and growth represent an important set of candidates for involvement in the pathogenesis. One study (Kent et al., 2005) found that brain-derived neurotrophic factor [BDNF] was involved in the pathogenesis of ADHD. BDNF is a member of the neurotrophin family that is involved in neurodevelopmental processes including the survival and differentiation of dopaminergic neurons in the developing brain, as well as being involved in glutamate-dependent neuronal plasticity in the adult (Kent et al., 2005). Another approach to finding the gene(s) that contribute to ADHD, involved a genome linkage scan in 204 nuclear families (853 individuals and 270 affected sibling pairs). Two regions (16p13 and 17p11) were found likely to harbor 'risk genes' for ADHD (Ogdie et al., 2003). In other studies, Cook et al. (1995) observed an association between ADHD and the 480-bp allele (or genotype) in the dopamine transporter gene (DAT). The dopamine transporter was found to be elevated by approximately 70% in adults with ADHD, according to single photon emission computed tomography (Dougherty et al., 1999).

By far, the gene most strongly implicated in ADHD is the 7-repeat allele of the human dopamine receptor D4 gene (DRD4), confirming a strong dopamine component in the pathogenesis of ADHD (Faraone, Doyle, Mick, & Biederman, 2001; Julien, 2005). Although there is compelling evidence that ADHD has a genetic basis, as yet it remains unclear exactly which genes are directly responsible for the disorder (Durstun, 2003).

### *Defining Hyperactivity-Impulsivity*

The DSM-IV-TR (APA, 2000) refers to hyperactivity as characteristic of an individual who often fidgets with hands or feet or squirms in seat, often leaves seat in classroom or in other situation in which remaining seated is expected, often runs about or climbs excessively in situations in which it is inappropriate (in adolescents or adults, may be limited to subjective feelings of restlessness), often has difficulty playing or engaging in leisure activities quietly, is often “on the go” or often acts as if “driven by a motor”, and often talks excessively. The DSM-IV-TR (APA, 2000) refers to impulsivity as characteristic of an individual who often blurts out answers before questions have been completed, often has difficulty awaiting turn, and often interrupts or intrudes on others (e.g., butts into conversations or games).

### *Defining Attention*

Sustained attention and distractibility are key deficits of an individual with ADHD. The DSM-IV-TR (APA, 2000) refers to attention difficulties such as excessive problems with distractibility, chronic struggles in organizing tasks and activities, attending to details, following instructions and completing tasks, and undertaking tasks that require sustained mental effort, as well as losing things and excessive forgetfulness. The literature on attention in children with learning disabilities distinguishes between sustained attention and selective attention. A deficit in sustained attention is defined as a gradual decline over time in the amount of attention allocated to a given task (Lilach & Yehoshua, 2003). A deficit in selective attention is defined as a difficulty in focusing on the relevant and ignoring the irrelevant features of a task (Lilach & Yehoshua, 2003).

Inattention prevents many students with ADHD from succeeding in a regular classroom (DuPaul & Stoner, 2003). Inattention means that an individual has difficulty sustaining attention

when effort is required. Behaviours associated with inattention include carelessness, difficulty staying on task, not listening, disorganization, failure to finish schoolwork and chores, distractibility, losing things, and forgetfulness (Montague & Castro, 2005). Children with ADHD seem to have an attentional bias toward novelty because they generally respond favorably to novel and stimulation activities and frequently are able to sustain attention in these situations (Montague & Castro, 2005).

In order to understand attention, researchers have looked at other cognitive functions like memory, perception, and executive functioning (Cooley & Morris, 1990). Children with ADHD have been found to perform poorly on the *Freedom from Distractibility Index* (FFD) on the *Wechsler Intelligence Scale for Children – Third Edition* (WISC-III), than non-ADHD peers (Siekierski, Jarratt, Rosenthal, & Riccio, 2003). Although the FFD is often interpreted as a measure of attention and concentration, there are a number of other possible explanations for performance on this scale, including anxiety, number facility, auditory short-term memory, and working memory (Siekierski et al, 2003).

#### *The Cognitive Profile Associated with ADHD*

There is evidence supporting the existence of cognitive deficits associated with ADHD (Durstun, 2003). The most convincing evidence is for poor inhibitory or cognitive control. Schachar, Mota, Logan, Tannock and Klim (2000) found that individuals with ADHD consistently demonstrated poorer performance and slower reaction times on go/no-go, stop- and Stroop paradigms. There is also evidence that children with ADHD are also impaired on paradigms that tax working memory, set shifting, planning and fluency.

*Executive Functions.* Barkley (1997) argued that the essential impairment in children with ADHD is primarily executive dysfunction. Executive functions (EFs) refer to a wide range

of central control processes in the brain that connect, prioritize, and integrate operation of subordinate brain functions (Kordon, Kahl, & Wahl, 2006). In a simplified model, EFs represent ‘top-down’ cognitive inputs that facilitate decision making by maintaining information about possible choices in working memory and integrating this knowledge with information about the current context to identify the optimal action for the situation (Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). EF tasks are suggested to comprise of at least four factors: 1) response inhibition and execution, 2) working memory and updating, 3) set-shifting and task-switching, and 4) interference control (Willcutt et al., 2005). In addition, most EF models distinguish between verbal and spatial working memory, and many include additional processes such as planning and organization, vigilance, and visuospatial orienting (Willcutt et al., 2005). One of the most important aspects of executive function is the maturation of the ‘working memory.’ Neuropsychologists have highlighted working memory as a central aspect of executive functioning (Kordon et al., 2006).

*Working Memory.* The link between attention and memory has long been recognized. Working memory refers to a subset of short-term memory functions that hold and manipulate information currently being processed (Kordon et al., 2006). Working memory hold the focus and immediate context of current attention and refers to the brain’s capacity to keep ‘online’ and actively use bits of information crucial for current functioning, while carrying on other functions (Kordon et al., 2006). With this current understanding of working memory, it is clear that many of the attention impairments associated with ADHD are closely tied to chronic ineffectiveness of working memory.

### *Areas affected in the Brain*

ADHD is thought to essentially be a chemical problem in the management systems of the brain (Brown, 2005). The area of the brain that regulates impulses, attention, and behaviour is thought to be under-active, compared to children without the disorder (Brown, 2005).

Executive functions (EFs), which are directly implicated in causing symptoms of ADHD (Barkley, 1997), are thought to be mediated by the thalamus, basal ganglia, and prefrontal cortex (Pennington, 2002; Willcut et al., 2005). Areas of the brain suggested to mediate EFs have been located based on observations that prefrontal lesions in individuals with traumatic brain injuries also tend to exhibit behavioural hyperactivity, distractibility, or impulsivity, as well as deficits on EF tasks (Fuster 1997). Casey, Durston, and Fossella (2001) claim that the prefrontal cortex is involved in interference control, and the basal ganglia is involved in response inhibition. The prefrontal region appears to be involved in protecting representations of relevant information from interference due to competing information (Miller & Cohen, 2001), whereas the basal ganglia appears to be involved in the inhibition of inappropriate behaviours (Mink, 1996).

*Anatomical Imaging Studies.* Structural imaging studies with computerized tomography or magnetic resonance imaging, found evidence of structural brain abnormalities among ADHD patients. These studies revealed total brain volume is up to 5% smaller in children with ADHD compared to matched controls (Castellanos et al., 2001, 2002). The most common finding has been smaller volumes in frontal cortex, cerebellum, and subcortical structures (Biederman, 2005). The cerebellum contributes significantly to cognitive functioning, presumably through cerebellar-cortical pathways involving the pons and thalamus.

Imaging studies have also implicated the corpus callosum in the pathophysiology of ADHD (Biederman, 2005). The corpus callosum connects homotypic regions of the two cerebral hemispheres. Reduced corpus callosum area has been reported in both anterior and posterior

regions, with the more anterior portions corresponding to the location of fibers from the prefrontal cortex crossing and the posterior findings corresponding to the fibers from the parietal and occipital lobes (Durstun, 2003).

Size variations in the callosum and volume differences in the number of cortical neurons might degrade communication between the two hemispheres, which might account for some of the cognitive and behavioural symptoms of ADHD (Castellanos et al., 2002).

While it does appear that poor inhibitory control and the deficits in fronto-striatal circuitry associated with ADHD are central, there is evidence to suggest that more posterior cerebral areas are also implicated in this disorder (Durstun, 2003; Biederman, 2005). Mesulam (1999) proposed that the superior parietal lobule and the lateral premotor cortex form the core of the network for selective attention. The superior parietal lobule appears to be involved in representing extrapersonal space and the lateral pre-motor cortex appears to be involved in orienting and exploratory movements. Many studies have demonstrated that the superior parietal lobule and the lateral premotor cortex are active in both overt and covert selective attention tasks (Nobre, Gitelman, Dias, & Mesulam, 2000).

*Functional Imaging Studies of ADHD.* Functional studies are also consistent with structural studies in implicating the fronto-subcortical systems. Three subcortical structures implicated by the imaging studies (i.e., caudate, putamen, and globus pallidus) are part of the neural circuitry underlying motor control, executive functions, inhibition of behaviour, and the modulation of reward pathways (Biederman, 2005).

Taken together, these findings point toward widespread cerebral reductions in volume associated with ADHD, with a possible preferential involvement of fronto-striatal and cerebellar regions, all of which are rich in calacholamines, which are involved in the mechanism of action of stimulant medications used to treat this disorder (Biederman, 2005).

## *Neurotransmitters*

During the last three decades, theories about the neurobiology of ADHD have focused on the monoamine subgroup – catecholamine (Pliszka, 2005), a member of a group of related biogenic amines that includes dopamine (DA), epinephrine, and norepinephrine (NA) (Freberg, 2006). Animal studies have found NA and DA play an extensive role in the modulation of executive functions (Arnsten, 2001).

*Norepinephrine.* Norepinephrine is a major monoamine and catecholamine neurotransmitter (Freberg, 2006). Neurons using epinephrine are called ‘adrenergic’ and neurons using norepinephrine are ‘noradrenergic.’ Neurons using norepinephrine as a neurotransmitter are found in the pons, medulla, and hypothalamus (Freberg, 2006). Projections from these neurons go to nearly every major part of the brain and spinal cord. Their primary role is to produce arousal and vigilance. In the peripheral nervous system, norepinephrine is found at the postganglionic synapses of the sympathetic nervous system, which is also involved in arousal (Freberg, 2006).

*Dopamine.* Dopamine is also a major catecholamine neurotransmitter. Dopamine is widely distributed throughout the brain and is particularly involved with systems mediating movement, reinforcement, and planning. Dopaminergic neurons in the midbrain project to the basal ganglia, the limbic system, and the frontal lobes of the cerebral cortex, which provide an important modulation of motor activity (Freberg, 2006). Another dopaminergic pathway arises in the ventral tegmentum of the midbrain and projects to various parts of the limbic system, including the hippocampus, amygdala, and the nucleus accumbens. The pathway is believed to participate in feelings of reward, and it may play an important role in addiction. Finally, another group of dopaminergic neurons in the ventral tegmentum projects to parts of the frontal lobe of

the cerebral cortex. These neurons may modulate higher-level cognitive functions, including the planning of behaviour (Freberg, 2006).

### *Summary*

Attention-deficit/hyperactivity disorder is the most common neurobehavioural disorder of childhood, and is also among the most prevalent chronic health conditions affecting school-aged children (AAP, 2000). The core symptoms of ADHD include inattention, hyperactivity, and impulsivity (APA, 2000). Children with ADHD may experience significant functional problems, such as school difficulties, academic underachievement, troublesome interpersonal relationships with family members and peers, and low self esteem (APA, 2000; Biederman et al., 1998; Trott, 2006). Individuals with ADHD present in childhood may continue to show symptoms as they enter adolescence and adult life (APA, 2000; Biederman et al., 1998). Pediatricians and other primary care clinicians frequently use parents and caregivers as the primary source of information to evaluate a child for ADHD (Sheehan, 1997; Thompson, 1996). Early recognition, assessment, and management of this condition can redirect the educational and psychological development of most children with ADHD.

### *Treatment of ADHD*

The most common treatments are medication, behavioural interventions, or a combination of both medication and behavioural treatments (LeFever, Villers & Morrow, 2002; NIMH, 2004b). For children with ADHD, there is no single treatment that provides the answer for every child. A child may have undesirable side effects to a medication that would make that particular treatment unacceptable. If a child with ADHD also has anxiety or depression, a treatment combining medication and behavioural therapy might be best choice (NIMH, 2004a). Each child's needs and personal history must be carefully considered.

## *Neuropharmacology*

Medication is the most widely used and accepted form of treatment currently used for ADHD today (Brue & Oakland, 2002; Chen & Taylor, 2005; LeFever, Villers, & Morrow, 2002; National Institute of Mental Health [NIMH], 2004a; Thompson, 1996). The belief that ADHD has a biological basis is supported by the positive effects of stimulant medications (Brue & Oakland, 2002). The goal of medication is that it will create a snowball effect; correcting the disruptive, intrusive and aggressive behaviours, therefore helping hyperactive kids with their peers (Chen & Taylor, 2005; Thompson, 1996).

*Amphetamines.* Amphetamines are also called *sympathomimetic agents* because they mimic the actions of adrenaline (epinephrine). Amphetamines produce vasoconstriction, hypertension, tachycardia, and other signs and symptoms of our normal alerting response. These drugs also stimulate the CNS, producing tremor, restlessness, increased motor activity, agitation, insomnia, and loss of appetite. These actions result from an indirect action involving the presynaptic release of dopamine and norepinephrine and, to a lesser extent, direct stimulation of postsynaptic catecholamine receptors. Representative amphetamines include amphetamine (sold as *Adderall*), dextroamphetamine (*Dexedrine*), and methamphetamine (*Methadrine*) (Julien, 2005).

The amphetamines exert virtually all their physical and psychological effects by causing the release of norepinephrine and dopamine from presynaptic storage sites in nerve terminals. In children, low doses of amphetamines are used therapeutically to reduce aggressive behaviour and activities characteristic of ADHD; in adults with a history of ADHD, behavioural calming can also occur (Julien, 2005).

*Nonamphetamine Behavioural Stimulants.* The effectiveness of stimulants in the treatment of ADHD is well documented and consists of the bulk of literature in child psychiatry

and pharmacology. Stimulant medications are the mainstay pharmacological treatment for attention-deficit/hyperactivity disorder (ADHD) in North America (Olfson, Marcus, Gameroff, & Jensen, 2003). They are prescribed to more than 80% of outpatients treated for ADHD (Olfson et al., 2003). *Methylphenidate* (Ritalin) is a nonamphetamine behavioural stimulant in which the regular-release formulation has a half-life of 2 to 4 hours. Mechanically, methylphenidate increases the synaptic concentration of dopamine by blocking the presynaptic dopamine transporter (a cocaine-like action) and also perhaps by slightly increasing the release of dopamine (an amphetamine-like or ephedrine-like action). When these drugs are injected intravenously, experienced cocaine users can perceive a cocaine-like or amphetamine-like rush, an action not usually experienced with oral dosage. *Pemoline* (Cylert) is a CNS stimulant structurally dissimilar to either methylphenidate or amphetamine. Pemoline is presumed to reduce ADHD symptoms by potentiating CNS dopaminergic transmission. It is thought to have a lower abuse potential than methylphenidate or amphetamines (Julien, 2005). More experimental evidence supports the safety, dosing, and efficacy of stimulants than any other psychopharmacological treatment for young people (Goldman, Genel, Bezman, & Slanetz, 1998); however, they may cause sadness in children (Chen & Taylor, 2005; Thompson, 1996).

*Selective Norepinephrine Reuptake Inhibitors.* *Atomoxetine* (Strattera) was the first non-stimulant drug to be approved by the FDA for the treatment of ADHD (Julien, 2005). It is claimed to be as effective as methylphenidate, probably without abuse potential. Atomoxetine is an inhibitor of presynaptic norepinephrine reuptake. Atomoxetine increases norepinephrine and dopamine release threefold in the prefrontal cortex without changing dopamine amounts in the striatal and nucleus accumbens, as do stimulants (Julien, 2005). In addition to positive effects on mood and attention, atomoxetine exerts positive effects on social functioning, improving patient motivation, energy, and self-perception (Keller, 2001).

*Antidepressant Drugs.* *Bupropion* (Wellbutrin, Zyban) is unique as an antidepressant in that it selectively inhibits dopamine and, to a lesser degree, norepinephrine reuptake. It is without effect on serotonin neurons. Because of its potentiation of dopamine, it has been used to treat children with ADHD, although this effect is not very robust (Julien, 2005).

*Formulations of Medication.* There are two different formulations of medication available to treat ADHD, immediate release (IR) and extended release (ER) (Julien, 2005). Standard IR has a short half-life and therefore requires several daily doses to provide coverage throughout the day (Wolraich & Doffing, 2004). The clinical effects of the IR formulations occur during the first 30 minutes following dosing, reach maximal effect across approximately 2 hours, and are no longer clinically apparent at 5 hours (Swanson & Volkow, 2002). For continuous daytime coverage with traditional IR formulations, a typical regimen for school-aged patients involves a dose following breakfast, one following lunch, and a third dose right after school to provide coverage for homework and other after-school activities. By contrast, newer ER formulations provide continuous clinical effects throughout an 8-hour school day and beyond. This extended coverage eliminates in-school and midday dosing (Swanson et al., 2004).

*Limitations of Pharmacological Treatments.* There are several negative effects for prescribing medication to manage ADHD type symptoms (Forte, 2005). The first, and questionably the most important, are the possible adverse side effects that children may encounter. Some “mild” side effects reported include sleep disturbance, reduced appetite, weight loss, tics, stomachache, headache, and jitteriness (Greenhill, Pliszka, & Dulcan, 2002). The Multimodal Treatment Study (MTA Cooperative Group, 1999), which is one of the most extensive research studies conducted on ADHD treatment, was conducted by the Division of Clinical and Treatment Research of the National Institute of Mental Health (NIMH). The MTA study reported 49.8% of children who were receiving medication encountered “mild” side effects,

11.4% reported “moderate” side effects, and 7% reported “severe” side effects. However, the NIMH did not define the terms “mild,” “moderate,” or “severe.” Kratochivil et al. (2002), compared the effects of two types of medication (atomoxetine and methylphenidate) on ADHD type symptoms. They reported that, “statistically significant increases in pulse and blood pressure were seen in both atomoxetine and methylphenidate” (Kratochivil et al., 2002, p. 781). Although this increase may not pose imminent danger to these children, there is no recommended termination date for many medications prescribed for ADHD. As a result, many individuals may be on medication for extended periods of time, and increased blood and heart rates over this time may create significant cardiovascular health problems (Forte, 2005).

### *Behaviour Management*

According to a recent publication, “over four decades of research substantiate the clinical efficacy of behavioural interventions as a primary, complementary, or alternative treatment for children with attention deficit hyperactivity disorder” (Rapport, Chung, Shore, & Issacs, 2001, p. 48). These interventions examine an array of behaviours, including academic performance, rule compliance, peer socialization, and relationship with parents (Forte, 2005). The goal of behaviour management is to increase the frequency of desirable behaviour by increasing the child's interest in pleasing parents and by (a) providing consistent positive consequences when the child demonstrates desired behaviours; (b) facilitating social learning by modeling desired behaviours; and (c) teaching problem solving skills that increase students ability to self-regulate and self-evaluate (de l’Etoile, 2005; Rabiner, 2000). Behaviour management skills are used in diverse settings, including the home, school, and leisure activities (Rapport et al., 2001).

Behaviour therapy techniques often involve various social networks, including families and schools, with parents and teachers working and consulting with trained mental health professional (Forte, 2005). Schwiebert and Sealander (1995) reported that there are two forms of

behavioural intervention: *antecedents of behaviour* and *consequences of behaviour*. The antecedents involve constructing an appropriate environment for the child and removing any stimuli that may provoke inappropriate behaviours. Consequential interventions are contingent upon the child's behaviour, in an attempt to increase positive behaviours and decrease problematic behaviours. The behaviour management techniques that have been researched and often used are point systems with reward and response-cost components, token-economies, feedback, timeout, social reinforcement, and daily reports (Pelham et al., 1993). Researchers have shown that these approaches are effective; however, depending on the constructs examined, medication may show more significant results (Pelham et al., 1993). Cognitive-behavioural interventions have also been used to manage ADHD type symptoms by "teaching the child generic cognitive strategies for solving academic-cognitive problems and to act as their own behaviour change agents" (Schwiebert & Sealander, 1995, p. 254).

Researchers investigating the effectiveness of behavioural interventions and cognitive interventions have found significant improvements, in a variety of problematic behaviours displayed in both school and home environments, using behaviour checklists and observation (Root & Resnick, 2003). Given some of the adverse consequences of medication and the demonstrated effectiveness of behaviour therapy, perhaps behavioural interventions should be used as the initial treatment approach (Forte, 2005). However, if a child is exhibiting severely problematic behaviours, and there is a need to decrease some of the adverse behaviours more quickly, it may be beneficial to implement treatments that take less time to administer and have more rapid response rates (i.e., medication management) (Forte, 2005).

*Limitations of Psychotherapeutic Treatments.* There are a number of limitations to implementing behavioural interventions, the most apparent one being time (Stage & Quiroz, 1997). Behaviour modification programs take a great deal of time and patience to implement. It

is a training process, in which the child learns appropriate behaviours through various techniques, such as repetition, contingencies, and reinforcements (Masters, Burish, Hollon, & Rimm, 1987).

A second limitation of behaviour management intervention is the amount of social resources used. Some behavioural management programs entail the involvement of parents and teachers, who must sustain tremendous efforts to maintain the intervention by providing the contingencies and reinforcements. This sustained effort may become a challenging task (Forte, 2005).

### *Combined Approaches*

Many studies have compared stimulant medication to behaviour therapy and/or combined behavioural–pharmacological interventions for children with ADHD (Firestone, Kelly, Goodman, & Davey, 1981; Horn et al., 1991; Klein & Abikoff, 1997; MTA Cooperative Group, 1999; Pollard, Ward, & Barkley, 1983). The largest of these was the fourteen-month MTA study, which included 579 children between the ages of 7 and 9 who were diagnosed with ADHD, Combined Type (Hinshaw et al., 1997). Children were randomized to one of four treatment groups: (1) Behavioural Treatment, including intensive treatment comprised of 35 sessions of parent training faded over time, classroom behavioural management training for teachers and bimonthly consultant sessions for 10 weeks, and the Summer Treatment Program; (2) Medication Management, consisting of stimulant medication (or imipramine for stimulant non-responders) delivered 3 times daily for the duration of the study; (3) Combined Behavioural Treatment and Medication Management; and (4) a Community Comparison control, in which families were free to seek treatment from a provider in the community (approximately two-thirds received medication; Pelham, 1999). Results of this study suggested that careful Medication Management was as effective as Combined Treatment in reducing ADHD symptoms, with no clear incremental benefit of behaviour therapy noted. However, combined treatment typically fared better than medication alone with regard to many of the socially valid targets of treatment (i.e.,

areas of functional impairment), such as improved social skills and parent–child relationships, including reduction of parent-reported harsh and ineffective parenting (Hinshaw et al., 2000). Secondary analyses support the superiority of the combined treatment in the normalization of behaviour (Connors et al., 2001; Swanson et al., 2001). Also, combined treatment may allow for lower doses of medication to be used in conjunction with behaviour management in the home and school settings, resulting in increased satisfaction with treatment (MTA Cooperative Group, 1999).

### *Treatment of Adolescents*

Numerous developmental and environmental changes characterize the transition from childhood to adolescence and therefore, it is unclear the degree to which treatments that are effective for children with ADHD are appropriate or effective for adolescents (Chronis, Jones, & Raggi, 2006). Smith et al. (2000) considered six important developmental changes adolescents experience that may have implications for treatment: (a) a greater cognitive capacity that includes the ability to think more abstractly and solve problems in a more systematic manner, (b) increased self-awareness of behaviour, (c) a focus on identity formation and increased independence, (d) greater reliance on peers for information and support, (e) a different daily routine at school involving increased educational demands, and (f) physiological changes such as growth and the development of secondary sex characteristics. Modifications to treatment may be justified based on these developmental changes. Suggestions for developmental modifications have included increased involvement of the adolescent in the treatment planning process, altering behavioural contingencies to include fewer tangible reinforcers and more opportunities to interact with peers and exert independence, increased collaboration and coordination with teachers, more focus on organizational, time management and homework issues, and use of self-monitoring strategies (Chronis, Jones, & Raggi, 2006).

## *Summary*

One of the primary goals of treatment for ADHD is to enable a student to develop adequate levels of self-control. When comparing pharmacological and psychotherapeutic treatments, there is no clear way to decide which treatment option is the “better” choice. Empirical evidence supports the use of both forms of treatment, and both options pose strengths and limitations. An important weakness element to note is “neither behavioural interventions nor medications typically normalize children in all relevant domains, nor do these improvements maintain during periods when treatments are not implemented” (Pelham et al., 1993, p. 506). Medication management appears to be more effective in a longitudinal study (MTA, 2000); however, there are the possible serious adverse side effects (Greenhill et al., 2002). The behaviour management approach is more time consuming and involves extensive social support and cooperation. Given the chronic impairment children with ADHD experience across multiple domains of functioning, multimodal or combined treatments are typically necessary to normalize the behaviour of these children (Chronis, Jones, & Raggi, 2006).

## *ADHD in the Classroom*

Inattentive and disruptive students present significant challenges to educational professionals. Students with ADHD are at high risk for chronic academic achievement difficulties, the development of antisocial behaviour, and problems in relationships with peers, parents, and teachers (DuPaul & Stoner, 2003). They are 3-7 times more likely than their peers to be retained, suspended or expelled, or to require special education (LeFever, Villers, Morrow, & Vaughn, 2002), and over one-third of students with ADHD do not complete high school (Pffner & Barkley, 1990). Students with ADHD also are at an increased vulnerability for depression and anxiety (Goldstein & Rider, 2005).

The core characteristics of ADHD (i.e., inattention, impulsivity, and overactivity) can lead to many difficulties in the school setting. Specifically, because these children often have problems sustaining attention to effortful tasks, their completion of independent seatwork is quite inconsistent (DuPaul & Stoner, 2003). Their performance on class work also may be compromised by a lack of attention to task instructions. Other academic problems associated with attention problems include: poor test performance; deficient study skills; disorganized notebooks, desks, and written reports; and a lack of attention to teacher lectures and/or group discussion (DuPaul & Stoner, 2003).

Children with ADHD often disrupt classroom activities, and thus disturb the learning of their classmates. For example, children with ADHD may exhibit impulsivity in a variety of ways, including frequent calling out without permission, talking with classmates at inappropriate times, and becoming angry when confronted with reprimands or frustrating tasks (DuPaul & Stoner, 2003). Class work and homework accuracy also may be affected deleteriously due to an impulsive, careless response style on these tasks (DuPaul & Stoner, 2003). In-class problems related to overactivity include children leaving their seats without permission, playing with inappropriate objects (e.g., materials in desk that are unrelated to the task at hand), repetitive tapping of hands and feet, and fidgeting in their chairs. These behaviours, however seemingly benign, can serve as a significant disruption to classroom instruction (DuPaul & Stoner, 2003).

Traditionally, this disorder has been identified and treated by clinic based professionals on an outpatient basis (DuPaul & Stoner, 2003). Given the fact that children and adolescents with ADHD experience some of their greatest difficulties in educational settings, increased attention has been paid the needs of these students by school-based professionals (DuPaul & Stoner, 2003). Because of the push for an inclusive classroom from school systems, strategies must be provided to both the teacher and the student with ADHD to allow successful academic

performance. A Strength Based Model (Chen & Taylor, 2005) directs teachers to emphasize the development of skills and strengths in spite of the disorder. Strengths can minimize the negative impacts of symptoms, and promote resilience.

### *Summary*

Many of the difficulties that characterize ADHD, both in terms of inattention and hyperactivity/impulsivity, may interfere with a child's classroom behaviour and their ability to learn, resulting in lower academic achievement and impaired functioning in the school setting (DuPaul & Stoner, 2003). As such, school-based professionals must closely work with parents and teachers in order to find effective ways of helping children with ADHD to perform better academically and to promote resilience (Chen & Taylor, 2005; DuPaul & Stoner, 2003).

### *Positive Effects of Music*

For centuries, music has been used for healing and stimulating emotions (Jausovec, Jausovec & Gerlic, 2006). The Greeks at Asclepius placed an ill person in the center of the amphitheater and used specific voices to heal that individual (Jausovec, Jausovec & Gerlic, 2006). Much later the beneficial influence of music on epileptiform activity in patients with seizures (Hughes, 2002), as well as in individuals with hearing loss (Tomatis, 1996) and early childhood autism (Rimland & Edelson, 1995) was reported. It was further suggested that music can accelerate learning of foreign languages, reading and mathematics (Lozanov, 1978), and retention of terminology (Panksepp, 1998). Music has the capacity to develop an individual's awareness of themselves and their environment, strengthen self-esteem, expand verbal and non-verbal communication skills, social skills, and ability to express emotions, improve ability to pay attention to task, and improve memorization skills (Canadian Association for Music Therapy, 2006).

In recent years, the effect of music on various cognitive domains has received significant media attention (Schellenberg, 2003). Clinically, parents of children with ADHD report that their children do homework while listening to music or watching TV (Abikoff, Courtney, Szeibel, & Kiplewicz, 1996). The effect specific musical pieces have on human behaviour has been explained as a consequence of their impact on positive mood and arousal (Husain, Thompson, & Schellenberg, 2002; Nantanis & Schellenberg, 1999; Panksepp & Bernatzky, 2002; Thompson, Schellenberg, & Husain, 2001). Listening to music affects arousal (degree of physiological activation), mood (long lasting emotions), and listeners' enjoyment, which in turn influences performance on a variety of cognitive tasks (Jausovec, Jausovec & Gerlic, 2006).

### *Memory and Attention*

There is some literature that indicates that the use of music increases both memory and attention (Canadian Association for Music Therapy, 2006). Morton, Kershner, and Siegel (1990) found increased memory for digits as well as reduced distractibility when children had previously listened to music. The children that participated in this study were not diagnosed with ADHD, so it is difficult to say if children with attention problems would react differently. Jausovec and Habe (2003) investigated the influence that auditory background stimulation has on neurophysiological activity in the human brain engaged with a simple visual cognitive task. Their results suggested that auditory background stimulation can influence visual brain activity, even if both stimuli are unrelated. In a study involving 12 bilingual Latino students, Ojeda (2005) found that background music offered greater improvement in concentration, as well as a greater decrease in aggression scores, as opposed to no music. Also, Latino music (popular or familiar music) was more effective than classical music in improving concentration.

A study by Cripe (1986) looked at activity levels of eight ADD boys between the ages of six and eight, when listening to rock music. The specific behaviours observed were activity level

and attention span. Results of this study indicated a statistically significant reduction in the number of motor activities during music periods within the test sessions. However, there were no significant differences noted regarding attention span. Other researchers have found that auditory stimulation through music can enhance certain types of ecologically valid tasks (Abikoff, Courtney, Szeibel, & Kiplewicz, 1996; Pelham, Hoza, Sams, Gnagy, Greiner, & Waschbush, 1994; Scott, 1970). Listening to music, specifically rock and roll music, improved children's math classroom performance, increased the completion rates of assigned academic seatwork, and increased the number of correct answers on an ability-related math task. The study by Pelham, Hoza, Sams, Gnagy, Greiner and Waschbush (1994) found that 30% of the children with attention problems had increased rates of task completion when listening to rock music, while none of the children without attention problems increased academic productivity. This illuminates the possibility that children with attention problems and those without react differently to rock and roll music.

#### *Arousal and Mood*

There has also been a growing interest in the connection between the tempo of music and cognitive performance. The *arousal and mood hypothesis* (Thompson et al., 2001) proposed that listening to music affects cognitive abilities; such affects can be attributed to changes in listeners' arousal or mood. Musical tempo seems to be associated primarily with arousal, such as faster tempi are more arousing than slower tempi (Schellenberg, Nakata, Hunter, & Tamoto, 2007). Schellenberg, Nakata, Hunter, and Tamoto (2007) had forty eight Canadian adults complete one of two subtests from the Wechsler Adult Intelligence Scale–Third Edition (WAIS-III, Wechsler, 1997) after listening to either a Mozart or Albinoni musical piece. When the listening experience led to a difference in arousal and mood (favouring Mozart), a parallel difference on an IQ subtest was also evident (favouring Mozart). These findings are consistent with the proposal that music-

enhanced cognitive performance is a byproduct of arousal and mood. The arousal and mood hypothesis provides a framework for understanding and explaining the *Mozart Effect*. The effect refers to enhanced performance on spatial–temporal measures after listening to music composed by Mozart compared to control conditions that involve sitting in silence or listening to relaxation instructions (Rauscher, Shaw, & Ky, 1993).

Brewer's (1992) research supports the theory that emotional state and tempo can influence cognitive ability. He proposed that rhythms in music and sound could be used to help individuals to slow down or speed up when they need a change in pace and could use music and sound to help them maintain a specific tempo. Through discovering how individuals respond to certain music and rhythm, they can integrate these aspects into the education experience to make learning easier (Brewer, 1992). Brewer (1992) stated that:

When we understand the effect of sound upon us, we can intentionally use it to create a desired sound environment. Our ability to learn well, to think and create, is a unique process that can be nurtured and enhanced. We can use the rhythmic, the tonal, and the emotional vocabulary of music to create an optimal learning state, to maintain our attention, and to help bond information within our minds, bodies, and emotions. Our learning experiences occur not only on the level of cognitive thinking, but also with our bodies and our emotions, creating an unspoken image within the mind.

We can quickly habituate to various sounds, such as the sound of an automobile when we ride in it. We can habituate to background music or the drone of a voice when it becomes monotonous. Brewer (1992) stated that when habituation takes place in the classroom, the whole track of learning can be replaced by boredom or frustration, which may elicit behaviour problems. Our attention improves when we are presented with a rhythm that elicits interest and curiosity (Brewer, 1992).

### *Use of headphones*

Children and adolescents with ADHD need to find what works best for them when performing tasks that require attention and concentration. At times this can be under rather odd conditions. For example Hallowell and Ratey (1992) suggested studying or working in a noisy room, on the train, or listening to music. According to Educational Resources and Counselling (2005), individuals with ADHD benefit from a work environment which is quiet but not necessarily noiseless; with the use of a fan or soft background music, consistent noise will often block out other distracting sounds. The use of headphones is beneficial if they are in a wide open space, such as a classroom (Educational Resources & Counseling, 2005). Brown (2005) suggested the use of headphones that play white noise or soothing music. Headphones help individuals who are very distractible, daydream or cease activity before completion and have trouble staying on task (*Accommodation Ideas*, n.d.).

### *Summary*

Literature indicates that music has the capacity to develop individuals' awareness of themselves and their environment, strengthen self-esteem, expand verbal and non-verbal communication skills, social skills, and ability to express emotions, improve ability to pay attention to task, and improve attention and memorization skills (Canadian Association for Music Therapy, 2006; Cripe, 1986; Morton, Kershner, & Siegel, 1990; Ojeda, 2005). Specifically, listening to rock and roll music was shown to improve children's math classroom performance, increase the completion rates of assigned academic seatwork, and increase the number of correct answers on an ability-related math task (Pelham, Hoza, Sams, Gnagy, Greiner, & Waschbush, 1994). For students with ADHD, boredom or frustration can easily occur in the classroom, which may elicit behaviour problems (Brewer, 1992). Background music listened through headphones can help individuals who are very distractible, daydream or cease activity before completion and

have trouble staying on task (*Accommodation Ideas*, n.d.; Brown, 2005; Educational Resources & Counseling, 2005). One explanation for the difference in human behaviour is music's ability to create positive mood and arousal (Husain, Thompson, & Schellenberg, 2002; Jausovec, Jausovec & Gerlic, 2006; Nantanis & Schellenberg, 1999; Panksepp & Bernatzky, 2002; Thompson, Schellenberg, & Husain, 2001).

### *Conclusion*

Attention-deficit/hyperactivity disorder is the most common neurobehavioural disorder of childhood, and is also among the most prevalent chronic health conditions affecting school-aged children, especially boys (AAP, 2000). The core symptoms of inattention, hyperactivity, and impulsivity (APA, 2000), may interfere with a child's classroom behaviour and their ability to learn, resulting in lower academic achievement and impaired functioning in the school setting (DuPaul & Stoner, 2003). As such, child physicians, school-based professionals, parents and teachers must work closely together in order to find effective ways of helping children with ADHD to develop adequate levels of self-control which may result in increased independence, experience of success, and increased resiliency (Chen & Taylor, 2005; DuPaul & Stoner, 2003). Research has established that adolescents are active users of music media (North, Hargreaves, & O'Neill, 2000), and that listening to music aids in developing cognitive skills such as attention and memory (Canadian Association for Music Therapy, 2006). Research that provides an in-depth look at the music listening experience of an adolescent with ADHD in completing school work will extend current understanding of adolescent music listening in a natural setting.

### *Purpose of the Study*

Given the promising literature linking ADHD, attention, and music, the study's purpose was to understand the challenges that one adolescent male diagnosed with ADHD faced in his life at school, and to gain a better understanding of how music could potentially affect his ability to

self-regulate and cope with the detrimental effects of ADHD during in-class seat work, and when completing homework. The guiding research question was: How is listening to music during individual seat work in the classroom and during homework, experienced by an adolescent boy diagnosed with ADHD?

## CHAPTER THREE: Methodology

In this chapter, I provide a rationale for conducting qualitative research using single case study method, present information on the case and other participants, the length of study, information on the music listening intervention, and the process of data collection through field notes, semi-structured interviews and attention checklists. This chapter also includes information on how data analysis through the creation of a case study data base and forming categories, led me to representing my results in both a descriptive manner, as well as data poem to summarize my final thoughts. Quality concerns such as internal and external validity and reliability, as well as ethical considerations that were made throughout the study, are also included.

### *Qualitative Research*

Qualitative Research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informants, and conducts the study in a natural setting (Creswell, 1998). This qualitative study generated detailed rich information about the experience of music listening during seat work and when completing homework. The studies findings illuminated its success as a self-management technique for one adolescent boy with ADHD. The decision to focus on qualitative case study stemmed from the fact that this design is interested in insight, discovery, and interpretation rather than hypothesis testing (Merriam, 1998).

### *Small-N Design*

Using a limited amount of participants or using *Small-N designs* address some of the drawbacks of nomothetic, group comparison designs (Barlow & Hersen, 1984; Kazdin, 1982) and provide a rigorous way to implement an idiographic approach to research. In education and psychology, this type of research is appropriate when individual differences are of major

importance (Barker, Pistrang, & Elliott, 1994). Small-N designs allow researchers to look at individual uniqueness and complexity. They are good for looking at phenomena in depth, demonstrating that certain phenomena exist, or disconfirming theories by providing counter-examples. They are poor at establishing typicalities or general laws (Barker, Pistrang, & Elliott, 1994). This type of research also gives a human dimension that is lacking in the predominantly statistical reports from the larger projects (Barker, Pistrang, & Elliott, 1994).

### *Case Studies*

A case study provides a detailed examination of one setting, or a single subject, a single depository of documents, or a particular event (Bogdan & Biklen, 2003). I felt this was an appropriate approach because, as Merriam (1998) noted:

A case study design is employed to gain an in-depth understanding of the situation and meaning for those involved. The interest is in the process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation. Insights gleaned from case studies can directly influence policy, practice and future research.  
(p. 19)

The single most defining characteristic of case study research lies in delimiting the object of study, the case (Merriam, 1998). Miles and Huberman (1994) thought of the case as “a phenomenon of some sort occurring in a bounded context” (p. 25). If the phenomenon is not intrinsically bounded, it is not a case. Merriam (1998) suggested one technique for assessing the boundedness of the topic, is to ask how finite the data collection would be, that is, whether there is a limit to the number of people involved who could be interviewed or a finite amount of time for observations. In this study the adolescent diagnosed with ADHD is identified as the case. The adolescent, as a case, is in a bounded context; there is an end to the number of people who could be interviewed, or observations that could be conducted (Merriam, 1998). This also met

Stake's (1995) definition of a case, being "a specific, a complex, functioning thing" (p. 2). The case was selected because ADHD is a condition of concern in the regular classroom, and because attention and music is intrinsically interesting (Merriam, 1998).

This single case study focused on holistic description and explanation (Merriam, 1998). Yin (2003) described this as a single-case (holistic) design. The rationale for using a single case was that the case represented an *extreme* case or a *unique* case (Yin, 2003). Either of these situations commonly occurs in clinical psychology when a disorder, such as ADHD, is being studied. This method provided an in-depth look at the experience of one adolescent boy with ADHD who listened to music during individual seatwork in the classroom and when completing homework. A case study approach allowed for flexibility in terms of data collection methods. Unlike experimental, survey, or historical research, case study does not claim any particular methods for data collection or data analysis (Merriam, 1998). Any and all methods of gathering data, from testing to interviewing, can be used in a case study (Merriam, 1998). Multiple sources of information were used in this study – observational field notes, attention checklists, and interviews with parents, teachers and adolescent. Patton (1990) pointed out:

Multiple sources of information are sought and used because no single source of information can be trusted to provide a comprehensive perspective...By using a combination of observations, interviewing, and document analysis, the fieldworker is able to use different data sources to validate and cross-check findings (p. 244).

Valuable information can be gathered from case studies, as long as their nature and limitations are understood (Barker, Pistrang, & Elliott, 1994). In general, case studies tell us what is possible but not what is typical. Similarly, they can suggest a possible connection or cause, but cannot provide strong confirmatory evidence (Barker, Pistrang, & Elliott, 1994).

### *The Case*

I used a unique, purposeful sample based on unique, atypical, or perhaps rare attributes or occurrences of the phenomena of interest, ADHD (Merriam, 1998). I was interested in the adolescent because he is unique or atypical in comparison to a student without any diagnoses in the regular classroom. The selection criteria for the adolescent participant were as follows: being male, between the ages of 12-16 years, and diagnosed with Attention-Deficit/Hyperactivity Disorder by a medical doctor or psychiatrist, as described in the DSM-IV-TR (see Appendix A). To meet the diagnostic criteria, the participant needed to display at least six characteristics for Attention-Deficit/Hyperactivity Disorder Inattentive Type, Hyperactive – Impulsivity, or Combined Type (APA, 2000), for more than six months. The rationale behind the participant selection criteria was partially based on the statistical findings surrounding the diagnosis of ADHD. Boys have higher ADHD diagnosis rates than girls (Breton et al., 1999; Valla et al., 1994), with a ratio of 2:1 for males and 9:1 for females (APA, 2000). The age range also represented a period when music is most listened to, and is valued as a way to satisfy emotional needs (North, Hargreaves, & O’Neill, 2000), and when there is increasing academic demands at the secondary level (Spinelli, 1998).

### *Other Participants*

After obtaining consent from a local school division, recruitment flyers were distributed around the city. The adolescent’s parents made initial contact expressing their interest in participating in the study. The adolescent participant met the screening criteria, and his school’s administration and classroom teachers gave consent to participate. The adolescent, his parents, and teachers were all identified as participants within this study. The adolescent’s parents provided information about thoughts, and feelings that shaped activity and family processes around their son’s ADHD diagnosis. As well as their attitudes and perceptions of his past and

current academic performance. The adolescent's teachers provided information on his past and current academic performance in the classroom, as well as details about their knowledge of the ADHD diagnosis, classroom strategies that were used, adaptations that were made to both instruction and assignments, and observations about the music listening intervention.

#### *Family and Personal History*

The family and personal history of the participant was gathered through semi-structured interviews with both the adolescent and his parents during the pre-study period. Through the two interviews, information was gathered on: family structure, family history, and family medical history, and his current living situation (see Appendix B and C).

#### *Diagnostic and Medication*

The diagnosis information was vital in insuring that the participant met the selection criteria. Information about the adolescent's current medication for treatment of ADHD was also essential in gaining insight into the time-of-day affects related to the type and formulation of his particular medication. Information on his diagnosis and current medications being used was obtained during the pre-study semi-structured interview with the adolescent's parents (see Appendix B).

#### *Length of Study*

The study ran for 14 weeks, from November 2006 to February 2007, and was designed around the school calendar. Data collection started with classroom observations and pre-study semi-structured interviews with the participant, his parents, and his teachers prior to the start of the second reporting period (term two), and ended shortly after the closure of the second term with the post-study semi-structured interviews with each participant. Music listening sessions lasted for 9 weeks, beginning on the first day of the second term, and concluded on the last day of the term.

### *The Music Listening Intervention*

The aim and goal of the music listening intervention was to create a classroom environment that was suitable for the student with ADHD to work productively in. Listening to music through head phones was used to create a reliable and constant stimulus; limiting the possibility of other environmental distractions so that the adolescent's attention and concentration could be focused on completing his assignment. The adolescent was given this time to explore his own experience of listening to music in terms of how it affected his ability to focus and concentrate, as well as how his body and mood was affected. The music listening sessions also provided the student with ADHD an opportunity to exercise autonomy in both the selection of music, and when it was listened. During music listening sessions, the adolescent was given questions and issues to be aware of when listening to music and reflecting on his experience (see Appendix D). The adolescent's parents were not given specific instructions on when to let him use music, but were encouraged to observe when the adolescent chose to use the music at home.

*Frequency of Music Listening Sessions.* Music listening within the classroom was left to the discretion of the teachers. To keep the identity of the adolescent participant unknown, his entire class was given the opportunity to try listening to music during in class seat work. If there was an opportunity to listen to music, the teacher made an announcement to the class to bring music the following day. It was then left to each student to decide whether he or she wished to listen to music during that specific period. The music was listened with a walkman, discman, or MP3 player using headphones, as to not be a distraction to any other student within the class. At home, the adolescent was free to choose to listen to music when he completed homework.

### *Data Collection*

Data collection and data analysis were a simultaneous recursive and dynamic process. Without ongoing analysis, one runs the risk of ending up with data that are unfocused,

repetitious, and overwhelming in the sheer volume of material that needs to be processed (Merriam, 1988). As suggested by Bogdan and Biklen (1982), I developed analytic questions prior to conducting each interview, wrote as many *observer comments* as I could along the way, wrote memos to myself about what I was learning, tried out ideas and themes on subjects, and explored the literature while I was generating data. These activities encouraged me to think critically about what I observed and heard, and to reflect on issues raised and how they relate to larger theoretical, methodological, and substantive issues. I also used and played with metaphors, analogies, and concepts during data collection and analysis: “Another way to expand analytic horizons is to try to raise concrete relations and happenings observed in a particular setting to a higher level of abstraction” (Bogdan & Biklen, 1982, p. 154).

Data collection and analysis is an ongoing process that can extend indefinitely; however, for this study, data collection concluded after the post-study interviews with the adolescent with ADHD, his parents, and his teachers. At this time, I observed an emergence of regularities within the data collected, or a sense of *integration*.

#### *Sources of Data*

Data sources included: field notes through observation, audiotaped semi-structured interviews with parents, teachers, and student participant, and attention checklists completed by both teachers.

#### *Field Notes*

Before and during the study, I observed the adolescent’s classroom and made note of items of interest in hand-written field notes. Things that I looked for included: the environment of the classroom; situation of the student’s desk in proximity to other students, teacher, and blackboard; amount of attention/concentration displayed by the student with ADHD; and, any

other behaviours I felt were relevant to the study and the understanding of the student with ADHD.

### *Semi-Structured Interviews*

Yin (2003) stated that interviews are one of the most important sources of case study information. The interviews in this study were semi-structured, as they were guided by sets of questions (see Appendixes B, C and E). The interview questions were used as an *aide memoire* (Toner, O'Donoghue, & Houghton, 2006), and the format of the interview was modified to accommodate the conversation style of each participant. Participants were allowed to digress as much as they needed and unanticipated issues raised by participants as being of importance to them were pursued. All interviews commenced with rapport building dialogue, and then moved into the semi-structured interview questions. No time limit was placed on interviews, and participants were encouraged to take as much time as required. Each semi-structured interview was audio taped and then transcribed. After the audiotapes were transcribed, participants had the opportunity to review the transcript for accuracy, and signed a transcript release form.

*Parent Interviews.* Before, during, and after implementing music listening I conducted audio-taped semi-structured interviews with the participant's parents (see Appendix B). The purpose of the pre-music implementation interview was to gain an understanding of how the parents felt about their child with Attention Deficit Hyperactivity Disorder, how the disorder affected his behaviour at home, what attitudes they had about their son's education, and what adaptations (if any) they had made at home.

The purpose of the interview during music implementation was to gain insight into their initial reactions to their son's music listening sessions in school, and whether he was listening to music when completing his homework. This interview was also to identify current or potential problems with the study that needed to change for the second half of the study, and also to

explore any new and interesting developments. For the second half of the study, the adolescent's parent's were encouraged to observe music listening sessions at home during the completion of homework, and his teachers were encouraged to increase music listening sessions in the classroom.

The purpose of the post-music implementation interview was to explore the parents' perceptions of their child's academic performance after the music listening intervention was implemented. I was curious about whether the adolescent used the walkman at home when he was completing homework or demonstrated any other changed behaviour that they felt was significant. I was also interested in hearing whether this study had effected or changed home life for them.

*Adolescent with ADHD Interviews.* Before, during, and after music implementation, I conducted audio-taped semi-structured interviews with the adolescent boy with attention-deficit/hyperactivity disorder (see Appendix C). The purpose of the pre-music implementation interview was to gain an understanding of what life was like for the adolescent with ADHD at school, how he experienced and understood his ADHD diagnosis, what types of self-management strategies (if any) he currently used or has tried in the past, and what his attitudes towards school were. I was interested in his perceptions of the study, and his attitudes surrounding the use of music in school. I was also interested in what types of music the adolescent currently listened to outside of school, and how he experienced music.

The purpose of the interview during music implementation was to gain insight into the adolescent's initial reactions to the music listening sessions in school, and whether he was listening to music when completing his homework. This interview was also to identify current or potential problems with the study that needed to change for the second half of the study, and also to explore any new and interesting developments. For the second half of the study, the

adolescent's teachers were encouraged to increase music listening sessions in the classroom, and the adolescent was encouraged to focus more attention to how music affects him when completing homework at home.

The purpose of the post-music implementation interview was to generate information about the student's experience and perceptions about listening to music in the classroom, how it was or was not beneficial, whether he would like to continue using the technique in the future, any suggestions for modifications, and how he felt the sessions have affected his studies and the quality of his work. I was also interested in what types of music he chose to listen to, and whether or not he found a difference in the type of music he listened to (rock, pop, rap, and so on). I wanted to understand how his awareness of his environment changed or was affected when he listened to music. Was he distracted by the music, or did the music eliminate other environmental distractions? By environmental distractions, I am referring to any noises, movements, or activity that may not be considered a distraction for a student without the ADHD diagnosis. For example, students whispering to each other, pencils dropping to the floor, desks shifting on the floor, florescent lights flickering, and so on.

*Teacher Interviews.* Before, during, and after music implementation I conducted audio-taped semi-structured interviews with the adolescent's two teachers who agreed to participate in the study (see Appendix E). The purpose of the pre-music implementation interviews was to gain an understanding of the teachers' knowledge of attention-deficit/hyperactivity disorder, what teaching strategies the teachers' were utilizing, and what modifications (if any) were the teachers' providing for the student with ADHD. The interviews were also designed to gain information on the educational status of the participant, his work ethic, and behaviour in the classroom.

The purpose of the interview during music implementation was to explore the two teacher's initial reactions to the music listening sessions in the classroom, and to identify current

or potential problems with the study that needed to change for the second half of the study. The two teachers provided insight into their observations of the adolescent with ADHD, and also explored any new and interesting developments. For the second half of the study, the adolescent was encouraged to bring his music into class every day.

The post-music implementation interview focused on the teachers' impressions of the sessions with respect to the atmosphere of the classroom, the attention and concentration of the student with ADHD, and the amount and quality of work that he completed when listening to music. The interview provided the opportunity for teachers' to suggest revisions for subsequent sessions or future applications, and an opportunity to comment on benefits and disadvantages of the use of music in the classroom. I was also interested in gaining insights into both teacher's attitudes about the use of music and whether either teacher would continue to allow the student and any future students with ADHD to listen to music during individual seatwork in the classroom.

#### *Attention Checklist*

The Attention Checklist (ACL) developed by Das (1986), was given to both teachers to complete before the study and three times throughout the implementation of the music sessions; after one week, three weeks, and seven weeks. The ACL was a checklist containing 12 items or questions (see Appendix F). Das and Melnyk (1989) recommended the checklist for use in rating students in regular classes to predict deficits in selective attention among ADHD children who were not cognitively impaired. Each of the 12 items were scored on a scale from 1 (not at all) to 4 (very much) according to the degree to which the behaviour is shown by the child (Das, 2002). Half of the items were phrased positively and half of the items were phrased negatively. For scoring purposes, a rating of 4 indicated the best attention and a rating of 1 the worst attention. Therefore, the maximum possible score that a teacher could give was 48.

The ACL had a high reliability; when compared to the Conners Rating Scale (Conners, 1973), the two scales had high reliabilities, as indicated by Chronbach alpha values of 0.94 and 0.96 respectively, and were found to have high correlation ( $r = -0.84$ ), based on 100 cognitively impaired adolescents (Das & Melnyk, 1989; Das, Snyder, & Mishra, 1992; Melnyk & Das, 1992; Padadopoulos, Das, Koderer, & Solomon, 2002). The ACL provided an objective/standardized measure to assess whether or not there was an effect on attention and concentration when the adolescent was listening to music while doing individual seat work.

### *Data Analysis*

In the process of data analysis, data was consolidated, reduced, and interpreted (Merriam, 1988). The goal of data analysis was to come up with reasonable conclusions and generalizations based on a preponderance of the data (Taylor & Bogdan, 1984).

### *Case Study Data Base*

After ongoing data collection and preliminary analysis was completed, analysis became even more intensive. However, before this was done, the information was organized in a fashion so that data was easily retrievable. This is called a *case study data base* (Yin, 1984), or *case record* (Patton, 1980), which is different from the case study report in that it pulled together and organized the volumes of case data into a comprehensive primary resource package. The case record included all the major information that was used in doing the case analysis and case study. Information was edited, redundancies were sorted out, parts were linked together, and the case record was organized chronologically for ready access (Patton, 1980).

Next, all the data that had been gathered together and organized chronologically (the case data base or the case record) was read through several times from beginning to end. As I read I highlighted, and jotted down notes, comments, observations, and queries in the margins. These notes served to isolate the initially most striking, if not ultimately most important, aspects of the

data (Goetz & LeCompte, 1984). A separate running list of major ideas that cut across much of the data was also kept. The notes were developed into a primitive outline or system of classifications into which data were sorted initially (Merriam, 1988). The outline began with a search for regularities – or observations of behaviour that frequently occurred in the presence of each teacher and/or parents. Patterns and regularities were then transformed into categories into which subsequent items were sorted. These patterns and regularities were also joined with a number of irregularities – or observations and/or accounts of behaviour and experiences that were different between adolescent, parents, and teachers. These paradoxes which existed within the data also formed definitive themes or categories.

### *Forming Categories*

Categories and patterns were discovered from the data (Goetz & LeCompte, 1984) by looking for reoccurring regularities and irregularities. Devising categories involved both convergent and divergent thinking (Guba and Lincoln, 1981). Convergence was determined by what things fit together – which pieces of data converged on a single category theme. Divergence was the task of fleshing out the categories once they had been developed. I also considered emerging categories or new information that contained experiences, information, and themes that were not expected at the outset of this study. Content of the data in developed categories was judged on their efficacy. Categories reflected the purpose of the research, were exhaustive, mutually exclusive, independent, and derived from a single classification principle (Holsti, 1969).

### *Data Representation*

Data was compressed and linked together by emerging commonalities and themes, as well as by recognizing competing and clashing views between participants. In addition to representing data in a conventional descriptive manner, I created a data poem to convey a holistic

and vocative rendering of the findings. The data poem was created based on transcript excerpts, from the multiple interviews with the adolescent, his parents and teachers, re-organized to convey a story (Moisiewicz, 2005).

### *Quality Concerns*

In this qualitative study, the traditional positivist criteria of internal and external validity were reconceptualized in keeping with qualitative inquiry (Denzin & Lincoln, 2000).

#### *Internal Validity*

Internal validity (also called trustworthiness and authenticity) assesses whether the findings accurately reflect the situation being studied. In this study, *triangulation* was used to increase the validity of findings. This is a procedure that involves using multiple sources of data, for example, to strengthen the credibility of reported findings. Throughout the study I made inferences from data, claiming that a particular set of data supported a particular definition, theme, assertion, hypothesis, and claim for example. Triangulation provides a means of checking the integrity of the inferences that I made. In this study, triangulation included the analysis and representation of reoccurring regularities in data collected from multiple sources: teachers, parents, and the adolescent.

I believe that the validity of the data was also increased because of the positive relationships I developed with the adolescent, parents and teachers. Trust was readily established because of my previous role as a teacher, and ongoing sibling relationship with a brother diagnosed with ADHD. I was able to share some of my own personal experiences and genuinely understand each participant's struggles and concerns during interviews. Establishing trust with participants so that they could be comfortable to answer interview questions truthfully and honestly, was also significant in increasing the internal validity of the data collected.

### *External Validity*

External validity usually refers to the extent with which the findings of a study can be statistically generalized to other situations. Because qualitative research does not use random sampling for example, generalizability needs to be thought of differently than in quantitative research. Merriam (2002) argued that external validity in the qualitative project should be thought of in terms of a working hypothesis, that is, hypotheses that reflect situation-specific conditions in a particular context. If one thinks of what can be learned from an in-depth analysis of a particular situation or incident and how that knowledge can be transferred to another situation, generalizability in qualitative research becomes possible (Merriam, 2002).

As conceptualized by Merriam (1998), external validity involves readers making decisions about generalizability. In adopting this approach, I provided a rich, thick description of the context of this study, which hopefully will allow readers to compare their situations with those of the participants and to transfer findings as appropriate.

### *Reliability*

Reliability refers to the extent to which the research findings can be replicated. The concept is obviously problematic in qualitative research projects, such as the present study, in which data is collected from a small, purposeful sample. Merriam (1998) suggested that in qualitative research, reliability should be reconceptualized to reflect the more pertinent criterion that findings be consistent with the data collected. In order to reassure the reader of the reliability of the data, I attempted to fully describe the social context of the study, the basis on which the participants were selected, and the participants themselves. To enhance reliability I also used triangulation and established an audit trail to enable others to follow my reasoning through the data analysis. Maintaining a chain of evidence allows an external observer to follow the

derivation of any evidence, ranging from initial research questions to ultimate case study conclusions (Yin, 2003).

### *Ethical Considerations*

Ethical approval was granted by the University of Saskatchewan Advisory Committee on Ethics in Behavioural Science Research (see Appendix G). The study was considered a low risk project although an adolescent was involved who was considered a 'dependent' participant, that is under the age of majority. However, no sensitive issues that could potentially be harmful to the participant were discussed. The study did not use deception nor request information about topics which were likely to be sensitive, embarrassing or harmful to the participant or others. The parents indicated their willingness to participate by signing the Informed Consent Form during the in-person contact. The student researcher read and fully explained the assent form to the adolescent participant who indicated his willingness to participate by signing the Assent Form. Both teachers indicated their willingness to participate by signing the Informed Consent Form during the in-person contact. Consent was verbally re-affirmed at the beginning of each interview with all participants.

## CHAPTER 4: Results

In the following chapter, I describe ‘Sam,’ an adolescent with ADHD, from his own perspective, as well as from his parents and his teachers’ perspectives. The chapter includes sections outlining Sam’s awareness of his personality, his diagnosis of ADHD, his experiences of listening to music, and three themes identified in the interview data. Information is also provided on Sam’s parents’ and teachers’ perceptions of his personality, his behaviour, and their own unique, and at times, contrasting conceptualizations of Sam’s experience of listening to music. Sam’s parents and teachers contributions provide a detailed look at the multiple contexts that he lives and functions within. Following final reflections from each of the participants, a data poem that represents my final reflections as researcher, is presented to conclude the chapter.

Certain conventions are used in the chapter. All quotes are identified with quotation marks and are from the multiple interviews with participants, which occurred before, during and after the study (i.e., the implementation of music listening at school). The speaker is either noted in the text or deemed not necessary to identify. All names and places are pseudonyms and minor changes to quotes were made to increase readability and ease of comprehension. Three consecutive periods indicate the deletion of conversation that was irrelevant to the passage’s significance and/or weakened comprehension, and square brackets identify non-verbal body language or clarify what was being referred to although not explicitly identified in the excerpt.

### *Sam*

Sam is 14 years old and is in his first year of high school. He is “thin, and still quite short,” which makes him appear much younger than his actual age. When I first met Sam, he was rather shy and quite; nervously playing with his dog during our interviews, and usually answering my questions with very quick and abrupt answers. At times his obscure or mumbled conversation was difficult follow, so clarification was frequently required in order to fully

understand his meaning and intent. At all times Sam was polite, eager and enthusiastic about the study, and extremely excited to be able to listen to music during class. Sam's love of music was evident throughout the entire time we spent together. For a young adolescent, he was able to convey strong emotions and experiences that connected him to music.

In school, his current teachers described him as being "a very hardworking student," who has a "whole bunch of energy." His parents noted that his brain is "going a hundred miles an hour constantly, because I know he's always thinking about six different things, and he's always thinking about what he's going to do...he's always has some ideas in his head." With such a busy mind, he also has a long list of interests and hobbies to match, including basketball, English and Social Studies, skateboarding, skiing, and Xbox and PS2. He was described both as a very respectful son and student; however, Sam reported that he does have "sort of an attitude in the mornings" because he is very tired. He also noted that it usually takes him a long time to become fully awake.

Sam has had negative experiences at school and with his peers. He has a long history of being verbally bullied, or as his parents reported "I'm going to say, for forever...his self-esteem has never been high, ever." With his peers he may be seen as "annoying" at times because he "tries to get attention," or seems "unapproachable," because "he has maybe an abrupt way of dealing with other students." Because of his behaviour and his small stature, Sam is an easy target for bullying. In school his teachers try to prevent conflict by having him sit closer to the front "around some girls that are fairly tolerant." When he was younger, his parents described him as insecure, and "scared to go anywhere by himself." His parents were always concerned with this, but never knew where the insecurity stemmed from or how to prevent this anxiety from occurring.

### *Sam's ADHD*

Sam was diagnosed with ADHD in kindergarten. When I asked Sam about his diagnosis, he commented that he doesn't remember when he was first diagnosed, and that at present, "it doesn't really bother me." However, Sam does say that he can not control his hyperactivity: "I try to control it but I can't really." He described ADHD as – "it makes you hyper and it kind of loses your concentration, and "you can't sit down or sit still." Nonetheless, he can concentrate on things that interest him, or things that he likes or wants to do, for example, waxing his drumstick, building a canoe, playing basketball, doing English and social studies, skateboarding, skiing, and playing Xbox and PS2.

Both of Sam's parents expressed that it was a relief to receive the ADHD diagnosis. His mother expressed that she was "very relieved because I thought, good, you know, at least it's not us, maybe we have to learn a little bit more, but it's not us, it's...he's different." Sam currently takes Biphentin once a day, which is a long acting form of methylphenidate. It lasts approximately eight hours, so "by the end of the school day it's pretty much done." When he uses the medication, his parent's describe him as being respectful; he doesn't bug people, and he can concentrate. Sam takes his medication in the morning when he wakes up, and the effects of the drug last until shortly after school. When the effects of Sam's medication has worn off, he is described by his parents as easily agitated, liking negative attention, and doing "four or five things at the same time, he can't just sit down and do one thing." He doesn't multitask effectively, blames others, doesn't sleep, and procrastinates. Sam can focus for about ten minutes at a time, and then "that was it; that was enough." His mother believed that he needed his medication to be able to succeed in school: "he couldn't go to school without his medication...he can't function without them [medication]." His father confirmed that the medication does work for him at school; however, when Sam first started taking medication, his father "felt kind of bad

because you would give him the pill and you could just see it kick in. He was almost like a zombie when it first kicked in.” His medication and diagnosis has caused some family conflict, including debates over whether or not to use medication. His mother noted, “we’ve really had to do a lot of different kind of educating.” For example, his mother recalled times when Sam was criticized for not eating much before he left the dinner table. What family took for rude table manners was, in reality, a lack of appetite as a result of medication combined with an inability to be attentive and sit still. One problem with the medication is that “he really doesn’t have an appetite at all, ever.” Mutually enlightening themselves and their extended family to the unique behaviours and conditions of ADHD has been significant in creating an environment of acceptance for Sam.

*Sam’s Teachers Understanding of his ADHD.* Sam’s first teacher defined what she believed was characteristic of an individual with ADHD as follows: normally having a “lack of focus on what ever task is at hand and [problems] sustaining focus...[the individual] may or may not have hyperactivity involved.” In her understanding, ADHD could simply mean a “lack of ability to sit still, fidgeting...daydreaming a lot, or maybe doing something else other than what they are supposed to be doing [the task at hand].” This teacher also commented about individuals with ADHD’s lack of ability to “organize and plan what they are supposed to do...impulsivity, because they’ve missed bits of information.” According to her understanding of ADHD, Sam does have some of the “typical characteristics of attention deficit disorder, but I also realize that he is on medication.” Because Sam is on medication, he does not exhibit as many characteristics as normally would be seen, such as moving around the room, continually talking or interrupting others, playing with objects in desk, repeatedly tapping pencil, and so on. She noted that some days are better than others though: “I’m not sure if those are days where he isn’t on medication...he’s actually quite hyper...moving around the room...not attending to what he’s

supposed to be doing.” This teacher noted that he will often be working on something rather than listening to instruction: “even though he might be able to multitask [listening to instruction while working on the assignment], it’s hard to tell when a person can multi-task.” She mainly works on “teaching him to listen to the teacher when he is supposed to.” Sam was described as a very “hard working student” who “makes a lot of effort” and will “often work ahead” and is “very keen, trying to keep notes organized.” This teacher found that because Sam generally does not present the behavioural characteristics of ADHD, he seems to ‘fly under the radar,’ and does not require considerable attention from teachers.

Sam’s second teacher defined what she believed was characteristic of an individual with ADHD as follows: “typically these are students that are of average or above average intelligence. But their issue is that they cannot focus in a classroom long enough to learn the work. So often their marks don’t show their ability.” Behaviourally, individuals with ADHD “tend to be more active, they fidget, are up and about and moving, sometimes they talk more than they should.” The main problem that manifests is “they just can’t seem to focus.” She also commented that ADHD doesn’t go away when you grow up: “sometimes you develop better coping mechanisms as you get older, but it can be something that you cope with all your life.” Some things that individuals with ADHD can do is “try a different diet, or they try medication...for some kids it’s just a daily struggle, and sometimes those kids get depressed I guess or upset or frustrated.” For individuals who are treated with medication, she observed “often it starts to wear off as the day progresses, and so during the school day you don’t maybe notice too much, but if you see them after school hours they can be somewhat more, active, or antsy, or unfocused.” His teacher reported that during an after school three-way conference between her, Sam, and his parents, his medication had worn off and

I could tell he was far less able to sit still. Far less able to focus. All of the things that you kind of [see in an individual with ADHD]; then I would say, here's a kid with attention deficit, but I don't see any of that in the classroom.

Similar to the other teacher's opinion, this teacher also commented that Sam does not exhibit many outwardly disruptive behaviours, typical of an individual with ADHD: "if I hadn't known that he was ADHD and on medication, he's not a kid I would have picked out of a crowd as being ADHD...I would have picked him out as just being nervous or high stressed." Sam does not require the same amount of his teachers' attention as other students in the classroom because ... [he] exhibits differently...he's not one who's up wondering around ever, he doesn't ask to go to the bathroom a lot, he's not talking and interrupting class. It's just if he's focusing on other work, not what he should be, that's his only attention issue in class.

### *Sam's Family*

Sam is from a family of four, however, since his older sibling moved out a number of years ago, he lives more as an only child. His parents both work full time; his father does maintenance work, while his mother works as an educational assistant. Both of Sam's parents are home by the time he is done school so that they can help him complete homework, drive him to basketball, or to the arena to watch hockey games. Sam's parents were both very kind and welcoming, preferring to do their interviews together, rather than separately. This created a unique and 'true to life' family dynamic surrounding how questions were answered, as well as providing a first hand look at which issues they either shared a common understanding or held conflicting views. Sam's parents have quite different personalities. Sam's father was quiet and reserved. For the most part, he sat quietly and agreed with most that Sam's mother had to say about Sam. He became more verbal and voiced his opinion when he felt strongly about what was being discussed, or was adding in some humor with a joking comment. In contrast, Sam's

mother was outspoken, with clear opinions, a strong voice and warm presence. She appeared to be the dominant voice and presence in the family and was very passionate about Sam's diagnosis of ADHD, and his educational history. Because she works in the school system, Sam's mother has been very involved with his teachers; asking how he was doing, if he had any homework and if there were any concerns with him. Being an educational assistant provided her with insight into school policies and available resources, which increased the strength in her position of advocacy for Sam.

### *Sam and School*

Sam's parents have been continually supportive of him and the struggles that ADHD poses in his academic life. Sam had problems in elementary school as it was "unstructured," there were "no consequences," and "no discipline." Sam described elementary school as having to "sit in desks all day," with teachers who did nothing to help him with his attention. Some things that Sam's parents have done to support him have been to have clear and consistent communication with teachers and administration:

We told them always at the beginning of the year, you phone us, you send us notes home, do whatever you have to do, stay on top of him, and don't let him get behind without letting us know...I talked to the teachers everyday, you know, I had to!

Now [in high school] "he's enjoying school, he's doing his homework." His teachers described him as "one that makes a lot of effort." Sam currently likes Social Studies and English: "things like that I can concentrate well on cause it's interesting." According to his parents, "if he's interested in the subject, then he puts more effort into it." Sam commented that it's easier [in high school] because "we move around like every hour...I can go run every hour...so I can settle down." Sam reported that when he studies, he can usually concentrate for about 10 minutes at a time before he loses focus. Since starting high school, Sam tends to get his work down ahead of

time. He reported this is because “I’m more fast, I can concentrate more.” However, some days are better than others, “there seems to be a bit of a roller coaster affect.” Sam exhibits characteristics such as impulsivity, as his teachers reported that he is “often working ahead” which causes him to miss information and instructions that he may need in order to do a good quality job on his assignments: “he will sometimes rush through something quickly, maybe not getting the details that he requires.”

One of Sam’s teachers described him as being “nervous or high stressed...and I’m not clever enough on attention deficit to know if its part of that, or if that’s another issue he deals with.” She also noted that she was “concerned about him being too much under stress... his parents are very supportive and they want him to do well, but I don’t think that the pressure is coming from them...it’s an internal thing that he’s doing to himself.” This teacher commented that in the past, Sam had not always been good at getting work in “and I think that he really wants to do well. So I think that he puts extra pressure on himself. So I think some of the stress is him wanting so desperately to make sure that everything comes in.” She expressed significant concern about Sam’s level of stress:

I look at him, and I think ulcer by the time he’s twenty. You know he’s just always worked up about stuff or worried, and not like mad worked up, but kind of, he’s like got the furrow. He’s a kid who furrows the brow quite frequently, and I just think he puts a lot of pressure on himself.

Importantly, she believed that in order for Sam to succeed in class, he needed to know that he shouldn’t “race through things or rush through things, or, um, or be stressed.”

*Sam’s Current Classroom.* Sam reported that he has had a positive experience in high school compared to his years in elementary school. Part of his success can be attributed to the co-teach classroom he was placed in for two core subjects. A co-teach classroom is a classroom

consisting of students who are identified as benefiting from having more than one teacher to assist them in the classroom. Students are referred to the co-teach classroom by their grade eight teacher or special education teacher because of weak reading or writing skills, and if they are disorganized or inattentive – common characteristics in children and adolescents diagnosed with ADHD. The co-teach class consists of two teachers (context and process facilitators) and fewer students than in a regular class. Referral forms to the co-teach classroom consist of information regarding scores of cognitive and academic standardized testing, their strengths, interests, learning styles, social and emotional behaviours, and accommodations presently used and need to be continued or adaptations that are to be implemented. Common strategies used in the co-teach classroom were the use of unit organizers, subject organizers, linking past knowledge to new material and concepts, constructing concept webs and maps, developing class and weekly reminders, and organizing binders daily.

When I entered the co-teach classroom, it appeared to be like any other classroom: desks, posters, student artwork and projects, an overhead projector and a blackboard. However, there was more to this classroom than first glance. Careful attention was given to the organization and structure of each class period. A daily schedule, including period times and break times was posted, the date was clearly written on the chalk board, rules were displayed on large sheets of paper, homework assignments were written on a white board, and reminders were written on the side of the chalk board. All these ‘minor’ details were done daily in hopes of teaching the students the importance that organization and time management can play in their success as students with a learning disability and/or ADHD. As in most environments, there were distractions in the classroom; drama props, plants, and Social Studies and English posters along the walls. In each direction there were a number of diversions to gaze at during the course of the day.

Class started with the reading of student notices, the date and an outline of what would be covered in class was posted on the chalkboard, and material covered in the previous class was reviewed before starting on new material. Within the classroom there was a lot of discussion when students were given time to complete individual assignments. They seemed to easily distract one another; asking questions about the assignment, or more frequently, questions about the recent game, the dance, movies, TV and music. Once off topic, students appeared to have a difficult time getting focused without constant reminders from either teacher.

*Sam's School's Policy on Music.* Within Sam's school, there was a general policy in place that restricted all use of MP3 players. One of Sam's teacher's explained that the policy against MP3 players was recently implemented because of ongoing issues that were being brought to administration from classroom teachers. She reported that:

The one issue, the ongoing issue which is one of the reasons why they pulled the ability to use it, is that kids then want to use it all the time. And as iPods and things get smaller and more discrete, sometimes it's really hard to notice that a kid's plugged in, because if they have a little bit longer hair and the iPods inside their clothing and there's this little wire coming up around their ear, but it's under their hair [so it's hard to see]. Um, in the past that was never an issue because they were far bigger machines and they'd be on their desk.

With high-speed internet, downloadable music and MP3 players, students now can have instant, continuous, easy access to their favorite music, and at Sam's school, some students abused the privilege of listening to music in the classroom. These students lost their teachers' trust by listening to music when they should have been paying attention to a lecture or presentation. Rather than seeing MP3 players as a potential tool for motivation, increasing memory, and sustained attention during individual seatwork, many teachers in the school started to feel that

MP3 players were only becoming a nuisance that caused additional classroom management problems. This is why a no MP3 player rule was established in the school. One of Sam's teachers agreed with the "no MP3" rule because "when you do start to allow them to come in [MP3 players], then suddenly that line is crossed and the kids want to use them all the time."

Another potential problem associated with MP3 players in the school was misusing the MP3 players during exams. The feasibility of concealing an MP3 player coupled with new technology, creates a situation where students can upload pre-recorded audio files onto their MP3 players and access exam answers. One of Sam's teachers noted that:

Students think that we should let them use it in an exam, and of course that's a problem because you could put all of your cheat notes on a wave file and then suddenly...right?...That's why a lot of teachers have just said 'no.' And like that's why the rule is there in the school, 'no.' Because it's too easy to hide them now.

#### *Music and Sam*

Prior to this study, Sam mainly listened to a very eclectic collection of music, including: "alternative and well, hard rock, I like R & B, rock, pop, things like that." However, Sam reported that he found the most success concentrating and completing school work when listening to hard rock: "I think it was like hard rock. Like a lot of, sort of shouting and, but not shouting, but like loud music...some of them are my favorite songs." Sam seemed to benefit from the loud music with its strong beat and lyrics: "I can focus with ones that are loud because, I don't know why but it's just, I guess I like the louder ones better, so it's easier to focus with them...some of them are the beat, some of them is the singing, like the words that I like." The music seemed to 'pump him up' or energize him: "I liked the rhythm sort of...mostly upbeat." Sam hypothesized that the music increased his blood flow throughout his body and brain, which maybe increased his ability to think and concentrate: "It just like got me sort of going and like the

blood flowing and all of that. So that maybe it might of helps flow more in like, my brain or whatever, and study or whatever.” When asked how his body experiences or responds to music, Sam reported that “there are some songs that make it like I can feel like the hairs on my neck’s coming up, like there’s some songs that I really like and can move to, you know.”

Things that normally distracted him from his work included “some talking,” or “noises...a door, like squeaking and I’ll look back.” The type of music that he listened to limited the amount of sound distractions that he was exposed to when completing his work: “I can’t really hear anything because I have it quite loud...I was aware of like seeing everything that was going on. But I didn’t like listen to what was going on.”

#### *Music Makes Work More Fun*

One of Sam’s teachers reported that “he sure liked having the music, and so maybe that, you know, would make his attitude more positive when he was doing the work.” It appeared that this was the case, as Sam noted that when he listened to music, the assignment or homework was “not as boring.” In Sam’s eyes listening to music was a benefit, mainly because, “it’s fun to use music, it puts more fun into the day...[when listening to music] it was a lot more fun...when it was funner I could learn more.” He also noted that class seemed to be better because with the music “it was just easier to take all the work.” The never ending amount of work that was presented to him was easier to handle knowing that he could listen to his music while working through it.

Sam commented that he thought it would be a good idea to link theme music to subject areas as part of motivation and increased experience with the topic being studied: “I have music that I can listen to that relates to the stuff and then it’s like I’m there or whatever...like, I mean, if it’s something on Rome, I have like music like for war, you know. Like if they’re having a war or something like that.”

As noted previously, Sam has struggled with poor self esteem. Interestingly, music seemed to positively affect him in this area. Sam described music as adding *color* to a day which was once filled with dullness: “if you don’t listen to music it’s just talking and silence, but with music there’s sort of color, you know...like color.” Music seemed to put Sam in a better mood: “sometimes I might be down a bit and then I’ll listen to my music and I’ll feel a lot better.” If his day is “really dull and all that,” he’ll listen to his music and “it will be like more, adventure, or events in it.”

Sam’s parents observed that the music seemed to motivate him: “he’s kind of doing something he likes to do – listening to music, and getting his work done at the same time.” A positive change they noted that “it’s not a hard job for us to get him to do his homework.” In school, his parents speculated that being able to do something he loves to do – listening to music, “maybe it helps him enjoy the class more.”

### *Time is Different*

Sam reported that when listening to music, “time goes by faster, and it’s easier to get work done.” Time flies by for Sam because he “sort of zoned out in the music.” The music created an environment that “was a lot more funner so that the class went by faster and it, and it was a lot better.” Time focused on school work seemed to increase to the amount of time it took to go through his play list on his MP3 player: “however long the songs go for I can, I can concentrate for that long.” Sam also reported that he felt he could complete more work in a shorter amount of time: “when I listen to music I can get more done in a littler amount of time and I can, um, get like, a lot of studying done too.” Sam noted that when he listened to music he could concentrate for much longer periods of time when studying for a test. While he previously focused for 10 to 15 minutes before needing a break, with music his studying time doubled to

approximately 20 to 30 minutes: “probably a little bit longer, like, it was 20 to 30 minutes...because I’d usually study for about 10 to 15.”

The music also seemed to slow him down and keep him from rushing when completing his work. His father reported that “music helps him um, not to rush when he’s...like when, you know, he’s doing his final copy or whatever, he’s usually like trying to go through it real fast to get stuff done quick. But, I think that music helps him slow down a bit.” Sam also recognized that listening to music inadvertently improved his writing: “all I was concentrating on was the music, so that I didn’t have to concentrate on the time. So then I wasn’t rushing.” His father also reported that “his work is a lot neater now...Because he’s taking a little more time.”

### *My Memory Works Better*

Sam found that when he listened to music while he was studying, that the music actually helped him to retain and recall information for exams: “I can, um, get like, a lot of studying done too, and keep it in...like so I can recall it for the test.” Specific songs listened to when studying seemed to directly correspond to memory of the information he was reviewing at that particular time: “It was more easier to concentrate. And like I could just listen to music and then I could just remember what parts I remembered that from. Like, I could listen to the music and remember what words I said when I was listening to the...studying.” He could remember the songs he was listening to when he was studying certain topics, and that helped him to recall information for the test: “once I know a bunch of songs so that, like when I listen to them its like I keep remembering it, because I remember what part of the, when I study goes with this part of the song.”

Music also seemed to remind Sam of events or memories in his life. For example, he recalled how a song by Linkin Park called Numb reminded him of the actual sounds and feelings he had when watching his favorite hockey team:

They used to play it [Linkin Park – Numb] when they came out to skate. And I really liked that and it made me think of the team and how much fun I have there so, sort of, every time I hear that song it reminds me of that. When they come out, you can hear the pucks hitting the glass...I can picture it.

### *Existing Paradoxes*

There are many paradoxes which exist in the identified themes. These ironies add to the complexity of understanding how or why listening to music works for Sam. People tend to base new information on what they already know and believe to be true. Pre-existing biases and assumptions about learning and music can present difficulties in terms of accepting the apparent benefits of listening to music.

For Sam, music makes work more fun. This may be hard for some people to comprehend; how can it be work if it's fun? How can students actually be completing work and learning when they are listening to their 'tunes' and having fun? One of Sam's teacher commented: "I think an awful lot of kids, particularly younger grades, they're doing it [listening to music] because they want to listen to their tunes, and that they know that [this music] may not be helpful." Sam didn't choose to listen to music that was necessarily 'good' for him, but chose music that he enjoyed. Music that he appreciated ended up being the 'right' kind of music for Sam, as it allowed him to focus and concentrate for longer periods of time. For Sam, music provided motivation to do his homework because it allowed him to also do something that was enjoyable.

It was also ironic and counter-intuitive that Sam's hard rock music with its loud beat and fast tempo actually slowed him down and kept him from rushing. Sam's teachers believed that classical or instrumental music should be the best type of music to listen to when working because classical music does not have lyrics to sing along to or loud, harsh, distracting rhythms

that “get on your nerves” or create tense, unsettling feelings in your body. It is hard to counter these kinds of pre-existing biases and have teachers consider the possibility that the strong, loud beat and lyrics of hard rock music actually calmed Sam down.

Similarly, just as Sam’s experience of time changed with music, that is, music made time go by faster, it also paradoxically slowed him down and allowed him to write more neatly, focus longer, and get his work done in a shorter amount of time. It is hard to explain how this worked and benefited Sam in the classroom. For example, when time flies by, I personally usually feel like I did not get much accomplished in that amount of time. Consequently, I was puzzled by how music can allow Sam to slow down, yet accomplish more. These paradoxes create confusion or perhaps resistances for people who only seek to answer ‘why’ questions, and forget to ask the more important question of ‘how does’ it help?

### *Other Perspectives on Music and Sam*

#### *First Teacher’s Perception*

Sam’s first teacher reported that she had used music in the classroom in the past: “I can remember using it with some adult learners, playing classical music while they were doing some independent work...I played classical music for them to be sort of relaxed and working on what they were doing.” She expressed that this was an encouraging experience for herself and her students: “for the most part they had pretty positive feedback.” She had also used music in the special education classroom, a classroom that only has a few students present who receive specialized assistance in completing their work. In this special education classroom she had allowed students to use it as a “relaxation or calming device.” She also noted that she was pretty responsive to music:

There’s lots of music that irritates me, so in that way I’m responsive (laughing). And especially when I like to have certain times when I like it to be calm, if I’m doing

housework, or even in the mornings when I get up...just instrumental or classical music, just something that kind of is more relaxed. Loud or racy music tends to set my rhythm off...maybe because I'm around so many noisy environments that I don't want a lot of noise or abrupt music.

She did report that as the day goes on she does enjoy more upbeat music: "different cultural music, Latin American, to the pop songs now."

Sam's first teacher spoke candidly about her belief in the use of nontraditional approaches in an education setting.

That's part of my frustration sometimes in the school system that sometimes you know that there's things out there that will work for kids and if its turning off lights, lets do it, or if its letting them chew gum...or if they have to stand up to get their work done, whatever...but if all of a sudden you have that rule then its not really fitting.

She stated that she would actually advocate for the ability to use music in the classroom if it worked for an individual: "I'm kind of I guess a proponent of trying different things that would work, whatever works for the student." She thought that for some individuals, music may allow them to focus and stay calm. In some instances the 'no MP3 player' rule in the school was not realistic:

Like if you take that away [music], it's like taking glasses away from another person, so that now they can't read, that doesn't help them. Now they can't focus or now they can't stay calm...Sometimes I think we restrict...my feeling is that we restrict um, or quash some of the productivity of the kids because of those rules.

### *Second Teacher's Perception*

His second teacher had also used music in the classroom; however, the only

source of music at that time was the radio, which she felt, was “not conducive to learning,” as it was “quite choppy, like there’ll be some talking and then an add and then there’s a song and then you don’t get into a flow.” She felt that the kind of music that would be conducive to learning, “the kids wouldn’t agree on, which is why I don’t tend to bring instrumental stuff, because grade nine’s would not enjoy it.” At times she listens to music when she is completing her own work: “I’ll often choose instrumental. Not necessarily classical but instrumental, because I sing along to the words, and then I don’t concentrate...and sometimes kind of jazzy kind of stuff or whatever. But just as long as there’s no words.” In general, she enjoys listening to 1970’s or 1980’s rock, easy listening, and jazz, and does not like rap or country music.

Sam’s second teacher commented that the students “really enjoy the music.” The students were at times too eager to listen to music and continually asked to permission to listen to their MP3 players; however, “when they were allowed to listen to music they were fairly quiet.” She had a difficult time deciding whether or not the music was working for Sam, because typically “if he’s working on a project and his attention is on that project, then he’s really focused.” When he listened to music he was usually working on a project, “so certainly, he appeared to be focused on what he was doing. He would have to tell you if it was easier for him or not.” From her outside observations, he appeared about the same. She did comment that Sam “sure liked having the music, and so maybe that would make his attitude more positive when he was doing the work.”

This teacher was more ambivalent about music listening in the classroom as revealed in the following compilation of her interview statements:

For some kids I believe it does help. However, even the kids that it does help, I’m not always convinced that they are making the choices to use the kind of music that would help them...I think an awful lot of kids, particularly younger grades, they’re doing it because they want to listen to their tunes, and that they know that that may not be [what’s

best – classical or instrumental music]...because they're just singing along. So, ya, there's all sorts of...to me, in an ideal I can see the absolute advantage. In the real world I think that there's more of a disadvantage to it than an advantage because kids will sing along, they will use the wrong kind of music. Not everyone will, um, not everyone will focus with it, or on it, you know what I mean.

This teacher was troubled by not knowing exactly what was going on when students listened to music, were they “zoning out” or “zoning in”?

I'm not always convinced that they're more focused, because sometimes they're just listening to their music. But they aren't disruptive. So in a work period that's good, in a sense, because if you're going to zone, at least you're zoning quietly, and you're letting the people around you work. For those that it helps them focus, then it's great. But you can't always, as a teacher and with 37 kids, you can't always tell which one is zoning and which one is focusing with the music... From the outside looking, it's about the same. But whether he [Sam] felt he could focus better that's [something only he could answer]...you know, because really, when he's got something to do he'd settle down and he's doing it, and he's not thinking about other stuff. And that was the same with the music...But ya, from the outside looking in, it's hard to tell.

#### *Attention Check List*

The Attention Checklists were completed by Sam's teachers with the intent of providing a standardized evaluation of Sam's behaviour prior to the music listening intervention, and during music listening sessions. This source of data proved to be less helpful than expected as the checklist provided information on the outcome of attention, which the teachers deemed insignificant in explaining Sam's attention difficulties. However, the Attention Checklist did

stimulate conversation specific to the process of Sam's level of attention in the classroom, which may not have been as closely addressed or focused on with interviews alone.

Baseline data completed independently by the two teachers prior to introducing music listening indicated that Sam did not demonstrate many characteristics typical of an individual diagnosed with ADHD. More specifically, Sam's first teacher's observations recorded that he had a moderate attention span, seemed to be involved in classroom activities, did not daydream at all, could become easily engrossed in an activity, could stay with one activity long enough to complete it, and for the most part could work independently. Similar baseline data was generated by Sam's second teacher. Her observations indicated that he had a fairly good attention span, could listen reasonably attentively, was always involved in classroom activities, did not daydream at all, could become very easily engrossed in an activity, could stay with one activity long enough to complete it, could concentrate until a task was completed, could accurately heed directions, and could always work independently. Both teachers noted that Sam disregarded some directions or all directions and was easily distracted. One teacher also observed difficulties in listening attentively and concentrating.

When Sam listened to music in the classroom during individual seat work, most aspects of the Attention Checklist completed by the first teacher remained the same, with Sam's ability to concentrate increasing slightly. Sam's second teacher decided that the Attention Checklist did not accurately represent her observations. This teacher explained that because Sam did not demonstrate characteristics 'typical' of an individual with ADHD, the questions on the Attention Checklist did not fully capture or explain his behaviour. For this reason, she decided to verbally explain the Attention Checklist and Sam's behaviour in the classroom as follows:

He's a funny case...most days if he's detached from the activities it's because he's doing an assignment. So, he's detached, yet he's not. And the same thing, 'can he work with

one activity?’ Absolutely, but he won’t focus on instruction long enough to get to the end of it...he’ll move to an activity. ‘Does he listen attentively?’ No, but it’s usually because, it’s not that he’s talking, it’s usually because you’ve already handed him the paper and when you’re explaining it, he’s already half way done it. So, you know, ‘can he become easily engrossed in an activity?’ Absolutely yes. It’s not always the activity we want him to be engrossed in, but still it’s usually school work, so...he’s a funny kid, like usually, like if you give me these questions for almost every other ADHD kid I’ve ever taught you would have the same answers for a very different reason. Right? So, yes they are detached because they are daydreaming, or yes they are detached because they are doodling, or they’re talking or they’re walking around; whereas that’s not the case for him. So he is kind of a different case that way.

According to his second teacher, the outcome of the Attention Checklist created a profile of Sam that could not be evaluated simply through a final score. The drawback of the checklist’s outcome is that it does not describe the motivation behind Sam’s behaviour. For example, if he was identified as ‘distracted,’ or ‘inattentive’ on the Attention Checklist, his teacher reported that it was not for the ‘typical’ reasons that would be expected for a student with ADHD; Sam was not playing with something in his desk or talking to a neighbor, but was working ahead on an assignment when he should be listening to the lecture or the instructions. Because of the good intentions behind Sam’s distractive and inattentive behaviour, his teachers did not see this behaviour as typical of characteristics of ADHD as it was not outwardly disruptive.

In addition to the Attention Checklist, Sam’s first teacher also requested a separate form to record observation on the amount of work Sam completed in class, the accuracy of his work, and his writing technique (see Appendix H). Only his first teacher completed this form because she did the majority of marking and grading work in the classroom. Each aspect of his

performance in class appeared to be fairly consistent throughout the study; with only his accuracy of work and writing uniformity varying between slightly increasing and slightly decreasing, depending on the day. However, the validity of this data may have been compromised as this teacher reported that due to the busy school year, she did not always have the time to thoroughly check to see if there was a significant difference in his school work.

The results of this data indicate that any significant changes in Sam's attention, focus or mood, were not something that could be easily observed from an outside perspective, especially during school hours when his medication is still in affect. This data also underscores the challenges of reliably recording observations in a busy classroom. In a classroom with approximately twenty other challenging students demanding their teacher's attention, entirely accurate and representative observations are difficult to capture, let alone record.

#### *Parent's Perception*

The parents, on the other hand, clearly believed that listening to music was a positive experience for their son: "We think it's positive, it's a good thing." They saw a "huge change" in him, especially when he was studying for his final exams, "he had the music all the time when he studied...all the time. I think that's why we thought he wasn't really studying, but he was...I think that the music helped him to study." The music also provided motivation or incentive to study, "I think he didn't mind, you know when we'd say 'okay, you need to go for an hour and study.' And the first thing that he would do is pick up his music and go." By combining studying for a final exam with something that was very enjoyable for him, it was easier for Sam to initially get started and to continue studying: "he's kind of doing something he likes to do – listening to music, and getting his work done at the same time," so it's motivating that way.

Sam's parent's thought that music most affected him by decreasing the impact of environmental distractions. He was normally very easily distracted, "when he does work or when

he studies without music, everything distracts him! You know, he's calling the dog, he's asking us questions, he's turning the TV on...he's reading something about the Blades in the paper." But conversely, Sam's mother noticed "that when he's doing the work and he's got the iPod in, everything is fine because nothing around him distracts him. You know, like when we're talking, or if we're watching TV, nothing distracts him because he can't hear us, he can just hear his music, and do his work...If we can get him to do his homework without, you know, all the distractions, that's, that's all we ask." Sam's ability to concentrate and focus when listening to music has consequently relieved a considerable amount of stress from his parents. They no longer found it to be a struggle to get him to sit down and finish his work. Sam's parents speculated that "...because he's got the music in his ear so that's all he has to hear. He doesn't hear the stuff from the outside...it helps him to concentrate better." By having the earphones playing music directly into his ears, it was impossible to hear any noise distractions around him: "you kind of forget when he's listening to it and you start talking to him and you start asking him something, or whatever, and ahhhh! He can't hear me!" By reducing the impact of environmental distractions, Sam was able to sustain his focus and concentration.

As well as reducing the impact of environmental distractions, Sam also benefited from music's ability to decrease the rate at which his mind would wander off his school work. Sam's father commented that "if he didn't have that music his mind would be on something else. Like the next thing that he was going to do...so he would rush through and get to the next thing." Sam's mind seemed to focus more on the task and less on other irrelevant things. His father commented that he believed that the music "calms him maybe ... I think the music just kinda soothes his mind and whatever and just slows him down." By slowing down his mind, it was easier for Sam to relax, take his time, and also prevented him from becoming stressed out.

### *Participants' Final Reflections*

#### *Sam*

In terms of the study's meaning for Sam, he felt that the questions posed during the multiple interviews, caused him to explore topics and issues that he did not think of previously. That, along with the conscious act of listening to music gave him a greater awareness of the things that caused him to become unfocused: "like it's really helped, but that's...like I say, understand that things that take my mind off the work will probably help me to do better." In the end he found that music listening helped him in more ways than either he or I expected.

#### *First Teacher*

Sam's first teacher felt strongly that for some students, unconventional means are sometimes in order if it allows them to succeed. Because Sam did not display outward and disruptive behaviours typical of most adolescents with ADHD, his teacher did not witness, in the classroom, the full benefit of the experiences that he shared in his interviews. However, she did comment that even though she could not see outward signs of significant change, if Sam felt that it helped him, she would support him using the music in class: "Ya, I think that I would actually advocate for it. I'm a, kind of I guess a proponent of trying different things that would work, whatever works for the student." Because there is a policy against MP3 players at the administrative level, she would have to voice her opinion during staff meetings in order to create change for Sam:

So I would be an advocate...as for music, I think that I would consistently say like when that's come up at meetings...because it has come up at meetings...I'll say well, however, it's sometimes beneficial for kids with learning difficulties or special needs to have that. So it can be a benefit to them, so it's not... like if you take that away, it's like taking glasses away from another person, so that now they can't read, that doesn't help them.

[laughing] Now they can't focus or now they can't stay calm, that doesn't help them, so I don't see the benefit in that.

In the end, Sam's teacher became open to another unconventional, yet helpful aid to use in the classroom. The challenge is to open the minds of others.

### *Second Teacher*

Sam's second teacher was very skeptical about the use of music in the classroom and whether or not he actually benefited from the experience. Similar to the first teacher's view, she did not consider Sam a disruptive student, therefore she believed he was the only one who could provide insight into what really worked for him. However, she believed that any benefit of the study was likely because the study helped him feel unique or special: "the best thing I think, over everything else for me ... was for him to feel kind of special...I think in the long run that no matter what effect the music had, that will have a good effect on him."

### *Parents*

The study changed Sam's parent's view of their son's study habits: "when he used to have music on to do his work, we'd always make him shut it off and do his work. But now we encourage him to put his music on when he's doing it." They were both very encouraged by what they observed during the study and believe that "it's helped him a lot." Sam's mother voiced that she would advocate for the use of music in the classroom because she strongly believed that it worked for him, and it may work for many other students: "I definitely know that it works. So I mean, I would, you know, I would tell anybody that it works...You know, music helps. It gets them focused...because they don't hear anything else that's going on."

### *My Final Reflections as Researcher*

I was struck by the competing and contrasting voices that I encountered in conducting the study, and created a data poem to evocatively and holistically represent the juxtaposition of

voices. In this case, the data led me to the unexpected and disheartening discovery that the boy's positive experiences with music listening in school were perhaps insignificant given the louder rule-and-order school culture, and furthermore, that perhaps research reporting positive findings on alternative self-management strategies, in this case music listening, may not always be sufficient to catalyze change that helps students.

Juxtaposition: ADHD and Music at School

**I try to control it but I can't really  
It makes you hyper and it sort of loses your concentration**

*He's impulsive  
Annoying  
Unapproachable*

**We had to sit in desks all day  
It was really hard  
...just talking and silence**

*He needs to have a little more maturity*

**But with music there's sort of like color  
Time goes by faster  
It's not as boring**

**It's easier to get work done  
It puts more fun into the day**

*School Rules: No MP3 players*

**When it was funner I could learn more!**

*For some kids it does help  
Sometimes I think we restrict... or quash some of the productivity of the kids because of those rules*

**Hard rock...loud music  
I can focus with ones that are loud  
Some of them are the beat, some of them is the singing, the words that I like  
It kind of pumps me up I guess**

*I'm not always convinced that they are making the choice to use the kind of music that would  
help them  
They will use the wrong kind of music*

**...It keeps me from rushing**

*If you take music away, it's like taking glasses away from another person, so that now they can't  
read, that doesn't help them  
Now they can't focus or now they can't stay calm*

**I sort of zoned out in the music  
The class went by faster**

*The music just kinda soothes his mind and just slows him down  
His self esteem has never been high*

**Sometimes I might be down a bit,  
then I'll listen to my music and I'll feel a lot better**

## CHAPTER 5: Discussion

In this chapter I provide a brief summary of the study and its findings, as well as the advantages and limitations of the research design. I position the findings of the study in terms of the extant literature, and also focus on unanticipated areas of research that emerged after the analysis of the data. New literature is introduced in this part of the discussion because it was identified later in the research as a result of the analysis. Last, I suggest practical implications for those involved with individuals with ADHD, as well as recommendations for future research.

### *Summary of Research*

This single, unique case study involved multiple interviews with Sam – one boy diagnosed with attention-deficit/hyperactivity disorder – his parents and teachers, as well as field notes based on my observations in his classroom, and Attention Checklists completed by his classroom teachers across a 14-week period of time. The study took an in-depth look at the challenges that one adolescent boy diagnosed with ADHD faced in his life at school to gain a better understanding of how music might positively affect his ability to self-regulate and cope with the detrimental effects of ADHD during in-class seat work, and when completing homework.

Results indicated that Sam's experiences of listening to music with headphones, specifically hard rock music during school and homework, increased the time that he was able to attend and concentrate and also increased his ability to memorize content and information for exams. Additional themes identified in the data included (a) changes in Sam's subjective experience of time when immersed in music, (b) an increase in mood and self-esteem as well as motivation, creativity and reflection in school, and (c) a positive effect in alleviating stress. Findings supported the use of combined approaches to therapy, as Sam's medication allowed him to focus whereas listening to music allowed him autonomy to self-regulate his attention,

motivation, and emotional state. The effects of music listening for Sam may have been very different without the presence of medication, just as the effects of medication alone were considerably different than when combined with music.

A notable feature of the results of this study was the difference between Sam's teachers and parent's observations and attitudes about his experiences listening to music. This adds weight to the evidence in the literature, which indicates that agreement between different sources is often minimal (Rickson & Watkins, 2003). Research suggests that *externalizing* behaviours are more accurately reported by the parent(s) (Rapoport & Ismond, 1996). Children and adolescents do have a tendency to present differently across settings and this seemed to be true in the present study, that is, the discrepancy between participants was indicative of the contexts in which Sam functioned. The context of school was stressful, and was full of interruptions and distractions created from peers. However, in this context Sam was on his medication which increased his ability to function in this environment. The context of home for Sam was a much more relaxed and safe environment to behave as he pleases. As well, the effects of his medication wore off by the end of the school day, which would add to the amount of *externalizing* behaviours that would be observed by his parents. With the knowledge that music can alleviate the effects of stress in adolescents and allow them to regulate their mood (Saarikallio & Erkkila, 2007), in theory, music should be more beneficial when used in the school environment. It would have been interesting to see if the effects of music listening within the classroom would have been more evident to his teachers if Sam was not medicated during school hours.

With all of the positive and confirming testimonies provided by Sam and his parents, this study also highlighted the pragmatic realities of working within a school context. With the clashing and competing voices between Sam, his family, and the school system, his positive

experiences with music may be seen as insignificant given the louder rule-and-order school culture. This realization moved me from originally conceptualizing the research within an intrapsychic framework to discovering that the findings were more fully examined and understood within a systemic ecological model (Bronfenbrenner, 1979). This model of the ecology of human development consists of four concentric ecological subsystems: microsystem, mesosystem, exosystem and macrosystem. The microsystem and the exosystem are social settings (i.e. families, classrooms, peers groups, children's and adolescents' meeting places, churches, clubs, and community centers), the mesosystem is the relationships between settings and the macrosystem is a set of abstract rules emanating from values and ideologies that regulates the micro-, meso- and exosystems. The importance of Bronfenbrenner's (1979) model is that it draws from turning the environment from *background to figure*, and emphasizes the significance of distal settings such as Sam's teachers' home or the school board office (exosystem). Sam's perceived experience of success using music was influenced by the music that his teachers personally enjoyed listening to at home, and by the decisions that were made regarding school rules and policies at the school board office. These are things that are outside of Sam's control; however, these systems which operate around him influence his ability to continue to use music. The school culture and context needs to be considered and strategically addressed if students are to benefit from practices that help even though they may be unconventional and not fully understood.

### *Context of Research*

The context of this research was a single-case (holistic) design (Yin, 2003) study, which focused on holistic description and explanation (Merriam, 1998). A case study provides a detailed examination of one setting, or a single subject, a single depository of documents, or a particular event (Bogdan & Biklen, 2003). This qualitative study generated detailed rich

information about the experience of music listening during seat work and when completing homework, through multiple interviews, Attention Checklists, and observational field notes. In this qualitative research study I decided to use the terms, validity and reliability, despite their association with quantitative research. They were reconceptualized to reflect a qualitative project. As a beginning qualitative researcher with longer standing experience with quantitative research, I decided to draw from both traditions as represented by Merriam (1998) rather than position the research solely in a qualitative paradigm.

Strengths within the present study were the multiple interviews with each participant that were conducted over a 14 week period. Because three interviews were conducted with each participant, there was ample opportunity to fully express his or her experiences, opinions, observations, concerns, and final or concluding thoughts after the conclusion of the music listening sessions.

During interviews with Sam's parents I felt that I acquired a rich understanding of the thoughts and feelings that shaped activity and family processes around his ADHD diagnosis, as well as attitudes and perceptions of their son's past and current academic performance. I also gained information about the types of routines Sam usually employed when completing homework, and the degree to which his parent's provided assistance for him. During the mid-point interview Sam's parent's expressed concern that their son was not being able to listen to music very often in the classroom. For the second half of the study, the Sam's parents were encouraged to observe music listening sessions at home during the completion of homework, and his teachers were encouraged to increase music listening sessions in the classroom.

During interviews with Sam, I gained a greater understanding of what it is like for him to live with ADHD. During the mid-point interview, Sam expressed his concern that he was not able to listen to music very often in the classroom. For the second half of the study, Sam's

teachers were encouraged to increase music listening sessions in the classroom, and he was encouraged to focus more attention to how music affects him when completing homework at home. In the final interview I received feedback from the adolescent on what advice he would give to other students with ADHD who are finding it difficult to sustain attention within the classroom, and what this study has done for him and his understanding of his diagnosis.

During interviews with Sam's teachers I felt that I acquired a solid understanding of the rules, routines, and adaptations provided within the classroom. During the mid-point interview both teachers expressed the concern that Sam was forgetting to either bring his music to school or was forgetting to bring it into the classroom. For the second half of the study, Sam was encouraged to bring his music into class every day. The study may have been stronger if additional time had been spent conducting music listening sessions in the classroom; however, I feel the data that was collected was sufficient for the nature of this study.

The Attention Checklist (ACL) developed by Das (1986), was given to both teachers to complete before the study and three times throughout the implementation of the music sessions. This source of data was meant to provide a standardized evaluation of Sam's behaviour prior to the music listening intervention, and during music listening sessions. The difficulty in having a standardized evaluation within a qualitative study lies in its ability to merely provide information on the participants measured outcome of attention. "Case study design is employed to gain an in-depth understanding of the situation and meaning for those involved. The interest is in the process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation" (Merriam, 1998, p. 19). In this study, I ended up more interested in the conversation that was evoked by the 12 questions provided on the Attention Checklist, rather than the outcome of the scoring results. Because both of Sam's teachers described him as being an uncommon adolescent with ADHD, the scores of the Attention Checklist did not capture the

reasons or motives behind his behaviour. For this reason, when Sam exhibits characteristics or behaviours that register on the Attention Checklist as typical of an individual with ADHD, the manifestation of these behaviours are for very atypical reasons.

### *Limitations of Research*

Findings must be considered with an understanding of research limitations. Limitations exist in the semi-structured interviews that were conducted throughout the study. Because there was no pilot test of the interview questions, or any validity data gained through research, the reader should be cognizant of this when considering the findings of this study.

Because this research only focused on one case, Yin (1994) may argue that the findings of are limited in their capacity to be generalized to the larger population. However, this study was not intended to be generalized, but to encourage individuals with ADHD to find unique or perhaps unusual conditions suitable to allow them to fully concentrate and attend. As well, the study was quite specific in its focus because it dealt with a male of a specific age-group with a diagnosis of ADHD. This case study has the capacity to extend the reader's experience by providing a rich, detailed account of one adolescent boy diagnosed with ADHD.

It is unrealistic to expect that the experiences and findings in this case study will be replicated exactly in other situations, which might appear to undermine the study's external validity (Yegedis, 1999); however, in a study which looks at the human experience of one individual, it is expected that those experiences would be individual and unique. This is not to say that similar findings many not occur in other situations. The reader may not connect with every viewpoint or experience, but draw upon and connect to particular areas of the text.

Another limitation of a case study design "is its limited capacity to generate knowledge that could be described as definitive" (Yegedis et al., 1999, p. 139). As there are an infinite number of variables, and interaction between variables, it may be impossible to identify and

define the variables and their relationships to one another. On the other hand, this study did carefully define a particular case – being the adolescent with ADHD. Keeping with Merriam’s (1998) definition of a case, the adolescent is a single entity; a unit that is bounded. In this study, I could “fence in” what I was studying. Through this research I can not make ultimate conclusions; although in research looking at human behaviour, there is little research that can conclude to be definitive. What this study does provide the reader with, is a detailed account of the ideas, feeling, thoughts, and conclusions of the music listening experience from multiple perspectives. These perspectives provide the reader a rich and saturated experience of the data.

Another potential limitation in this study rests in the inherent weakness in case study research stemming from the flexibility in its design. A common criticism may be that the researcher has allowed questionable evidence or “biased views to influence the direction of the findings and conclusions” (Yin, 1994, 9). This has also been referred to as narrative smoothing (Barker, Pistrang, & Elliott, 1994); that is, case studies including narrative selections from participants that are too selective and that are altered to tell a better story. In the present research project, I have tried to address this limitation by being cognizant of the potential for personal bias to influence the research, and as well by being aware of the ambiguity in the nature of the information being gathered. As well, to address the concern regarding lack of rigor, I tried to be careful and thorough in conducting the interviews and gathering information for this study. All of the interviews followed a semi-structured format, which consisted of a series of prepared questions to guide the interviews (see Appendixes A, B, and D).

Sam was selected as a participant based on the criteria that he was diagnosed with ADHD. Sam met the criteria for this study; however, issues around his current treatment became an interesting factor. Sam was treated with stimulant medication which lasted for approximately eight hours – the entire time he attended school. It was evident through the interviews with

Sam's parents and teachers that his medication worked very well for him, as he exhibited little disruptive, hyperactive or inattentive behaviours while he was in school. This poses the question whether the results of this study would be different if Sam was not already being treated with medication? Would his teachers have observed more of a change in Sam if he wasn't medicated; similar to the experience his parents had when observing and interacting with Sam at home after his medication had worn off?

### *Confirming Findings*

Many results of this study confirmed existing literature on attention-deficit/hyperactivity disorder, learning, music, and youth culture. In keeping with other research, there was a reported increase in the participant's level of attention (Brewer, 2007; Canadian Association for Music Therapy, 2006; Crncec, Wilson, & Prior, 2006; Ojeda, 2005), an increase in memory for academic information (Brewer, 2007; Canadian Association for Music Therapy, 2006; Jausovec & Habe, 2003; Morton, Kershner, & Siegel, 1990), and the positive use of rock music with headphones (Abikoff, Courtney, Szeibel, & Kiplewicz, 1996; Brewer, 2002; Cripe, 1986; Educational Resources and Counseling, 2005; Pelham, Hoza, Sams, Gnagy, Greiner, & Waschbush, 1994; Schellenberg, Nakata, Hunter, & Tamoto, 2007; Scott, 1970).

### *Attention*

For individuals with ADHD, staying focused for long periods of time while sitting and studying or writing can be difficult (Durstun, 2003). In school, it is inevitable that we spend time in this mode; however, additional studies have confirmed that background music can be used to help keep the mind and body in an attentive state (Brewer, 2007; Cripe, 1989; Ojeda, 2005). Both Sam and his parents attested to the struggles that he has faced in his academic life, and how Sam greatly benefited from listening to music while completing his school and homework. Sam noted that when he listened to music, he could concentrate for much longer periods of time when

studying for a test. Whereas he previously focused for 10 to 15 minutes before needing a break, with music, his studying time doubled to approximately 20 to 30 minutes: “probably a little bit longer, like, it was 20 to 30 minutes...because I’d usually study for about 10 to 15.” Additional studies confirm that background music may calm and focus children with special education needs, thereby enhancing learning (Crncec, Wilson, & Prior, 2006; Ojeda, 2005). To explain why an increase in attention would be seen, Brewer (2007) stated that music has the ability to stabilize mental, physical and emotional rhythms and facilitates students attaining a state of deep concentration and focus. In this state of mind, large amounts of content information can be processed and learned. This is especially important for individuals with ADHD to succeed in the classroom.

### *Memory*

The link between attention and memory has long been recognized (Kordon et al., 2006). With our current understanding of working memory, it is clear that many of the attention impairments associated with ADHD are closely tied to chronic ineffectiveness of working memory. A positive finding that unexpectedly arose during the study was that Sam found it was easier to study and recall information during exams when he studied while listening to music. Sam found that when he listened to music while studying, the music actually helped him to retain and recall information for exams: “I can, um, get like, a lot of studying done too, and keep it in...like so I can recall it for the test.” Specific songs listened to when studying seemed to directly correspond to memory of the information he was reviewing at that particular time. Songs, chants, poems, and raps are proven to improve memory of content facts and details and provide a hook for retrieving information easily later (Brewer, 2007). Other researchers have also linked music and increased memory (Canadian Association for Music Therapy, 2006; Jausovec & Habe, 2003; Morton, Kershner, & Siegel, 1990).

## *Rock Music*

Sam reported that he found the most success concentrating and completing school work when listening to hard rock: “I think it was like hard rock. Like a lot of, sort of shouting and, but not shouting, but like loud music.” Sam seemed to benefit from the loud music with its strong beat and lyrics:

I can focus with ones that are loud because, I don't know why but it's just, I guess I like the louder ones better, so it's easier to focus with them...some of them are the beat, some of them is the singing, like the words that I like.

Sam's experience was consistent with previously reported findings that listening to rock and roll music improved children's classroom performance (Abikoff, Courtney, Szeibel, & Kiplewicz, 1996; Cripe, 1986; Pelham, Hoza, Sams, Gnagy, Greiner, & Waschbush, 1994; Scott, 1970).

One of Sam's teachers had a difficult time understanding the choices in music that adolescent students in general were making: “I'm not always convinced that they are making the choices to use the kind of music that would help them.” She could not understand how students could focus and concentrate when listening to popular music, as she thought that “they're doing it because they want to listen to their tunes, and that they know that that may not be [what's best – classical or instrumental music]...because they're just singing along.” People tend to reference their own experiences in order to understand something new. In this case, both of Sam's teachers have positive experiences listening to classical and instrumental music when working, which made them hesitant to accept Sam's apparent experiences with rock music. The study by Pelham, Hoza, Sams, Gnagy, Greiner and Waschbush (1994) illuminated the possibility that children with and without attention problems react differently to rock and roll music. Additional research supports the theory that children and adolescent react more favorably, with increased

concentration and creativity, to familiar or popular music (Ojeda, 2005; Schellenberg, Nakata, Hunter, & Tamoto, 2007).

The hard rock music that Sam listened to seemed to ‘pump him up’ or energize him. Sam truly enjoyed the music that he was listening to when he was completing school work.

Schellenberg, Nakata, Hunter and Tamoto (2007) stated that much of the *Mozart Effect* (Rauscher, Shaw, & Ky, 1993) could be attributed to an increase in mood, as with music in other upbeat styles. The link between music and its positive effects on mood and arousal has captured the attention of many other researchers (Brewer, 2007; Husain, Thompson, & Schellenberg, 2002; Jausovec, Jausovec & Gerlic, 2006; Nantanis & Schellenberg, 1999; Panksepp & Bernatzky, 2002; Thompson, Schellenberg, & Husain, 2001). Playing upbeat music while students are reading or writing and their energy seems to be low or attention lagging, helps keep them focused on the task at hand and energizes tired minds and bodies (Brewer, 2002).

#### *Use of Headphones*

Educational Resources and Counseling (2005) indicated that individuals with ADHD benefit from a work environment, which is quiet but not necessarily noiseless; for example, using a consistent noise, such as a fan or soft background music, will often block out other distracting sounds. This is consistent with Sam’s experience of listening to music. The loud music through his earphones blocked out all other audio environmental distractions. His parents also confirmed that only with the use of headphones – playing music directly into his ears – could he block out all other distractions:

When he’s got the iPod in, everything is fine because nothing around him distracts him.

You know, like when we’re talking, or if we’re watching TV, nothing distracts him

because he can’t hear us, he can just hear his music, and do his work.

### *New Findings*

Because of the nature of qualitative research, new and unexpected topics and themes emerged during the collection and analysis of data. As Stake (1981) stated, “Previously unknown relationships and variables can be expected to emerge from case studies leading to a rethinking of the phenomenon being studied” (p. 47). As a result, new literature was reviewed and connected to the experiences of Sam and the other participants during the final stages of data analysis. In keeping with emerging literature, the present study found evidence that music may lead to (a) an increase in motivation, creativity, and reflection in school (Brewer, 2007; Gardner, 1999; Schellenberg, Nakata, Hunter, & Tamoto, 2007), (b) an increase in the brain’s ability to learn and remember new information (Le Doux, 2002; McGaugh, 2004; Phelps, 2006), (c) a way to relieve stress (Brewer, 2007; Crncec, Wilson, & Prior, 2006), and (d) a method of increasing positive mood and self-esteem (APA, 2000; Julien, 2005; Trott, 2006). I will also comment briefly on the changed experience of lived time while listening to music (Nicol, 2002; Schonhammer, 1989), and negative societal reactions to music listening (Schonhammer, 1989).

#### *Increasing Motivation, Creativity and Reflection*

Typically, individuals with ADHD avoid, dislike, or are reluctant to engage in tasks that require sustained mental effort, such as school work or homework (i.e., inattention); have difficulty playing or engaging in leisure activities quietly (i.e., hyperactivity); and/or have difficulty waiting in turn (i.e., impulsivity) (Durston, 2003). For students with ADHD, these symptoms can prevent success in a regular classroom and can also lead to low motivation and self-confidence in their abilities. Close attention should be paid to finding ways to increase motivation, and inspire creativity and reflection in students with ADHD.

Sam’s parents observed that music seemed to motivate him: “he’s kind of doing something he likes to do, listening to music, and getting his work done at the same time...it’s not

a hard job for us to get him to do his homework.” Most people enjoy listening to music, and as Rauscher (2002) stated, music can bring joy to our lives. Menon and Levitin (2005) found that listening to music activates the connections between several brain systems and strongly modulates activity in brain structures (amygdala, hypothalamus, insula, and orbital cortex) and brain chemical pathways (dopamine) that determine our feelings of pleasure reward. Sam’s parents speculated that being able to do something he loves to do in the classroom – listening to music – “maybe it helps him enjoy the class more.” Understood in a behavioural management framework, music is being used as a reward for the appropriate behaviour – sustained attention and concentration. Looking specifically at the antecedents of behaviour (Schwiebert & Sealander, 1995), music is also being used to construct an appropriate environment for the child by removing any stimuli (environmental distractions) that may provoke inappropriate behaviours.

Schellenberg, Nakata, Hunter, and Tamoto (2007) found that creative abilities of children increased after listening to familiar music. They tested the creative abilities of Japanese 5-year-olds after they were exposed to classical music (Mozart or Albinoni) or to familiar children’s music (listening or singing). They found that cognitive enhancement after music listening extended to tests measuring creativity, and that such enhancement depended on the match between the music and the listener. Each measure of creativity (i.e., drawing times; adults’ ratings of creativity, energy, and technical proficiency) revealed better performance after the familiar songs compared to the classical recordings. This was consistent with Sam’s choice to listen to his favorite music, which his teachers and parents personally found to be irritating or distracting. However, Sam enjoyed the loud, hard rock music, “some of them are my favorite songs,” and found he could concentrate and attend the best when listening to that type of music. He could not pinpoint why it helped him, just that he liked the music and it changed his experience with completing school work and studying for exams.

Background music can be used to stimulate internal processing, to facilitate creativity, and encourage personal reflection (Brewer, 2007). Sam recognized that music could be used for motivation and to enhance the learning experience. He suggested playing theme music when studying different topics. For example, playing battle music from soundtracks when studying the Roman Empire in Social Studies. Gardner (1999) suggested that we allow students to use musical language as a way to express their thoughts - create their own soundtrack to an important historical event, make up sounds to exemplify electrical current or communication between neurons, or improvise the sounds for planets. Brewer (2007) referred to music used to heighten an experience as an active concert. An Active Concert is course content information read while music plays in the background. Music aids Active Concerts by heightening the impact of the experience. A story read aloud with music that accentuates the mood and meaning of the story increases student interest and creates a powerful memory (Brewer, 2007). In Active Concerts, the music may fulfill the same purpose as a movie soundtrack, helping to gain and hold the involvement of the watcher. The more the viewer is drawn into the story, the more powerful is that person's experience of the film. The participation and involvement in learning is no different in the classroom where music can be just as much a key to student involvement as it is in the movies.

Saarikallion and Erkkila (2007) examined the role of music in adolescents' mood regulation, and found that music promoted mental imagery and reflection. Larson (1995) argued that, in early adolescence, solitude becomes a constructive domain of self-reflection, emotional discharge and personal renewal, and music is used to construct this domain. Music seems to promote the clarification and understanding of adolescent feelings (Saarikallion and Erkkila, 2007).

### *Excitement Induces Learning*

Emotional arousal enhances memory formation by positively influencing the period of neurobiological activity, called consolidation, that establishes a memory in the brain (McGaugh, 2004; Phelps, 2006). Le Doux (2002) noted that we “remember particularly well...those things that arouse our emotions” and that heightened emotional excitation engendered by hormones and amygdala activity strengthens both conscious and unconscious memory formation (p. 222). McGaugh’s (2004) review of research on the brain basis of emotion and memory led him to conclude that “emotionally significant experiences, whether pleasant or unpleasant, activate hormonal and brain systems” through which “our emotionally exciting experiences become well remembered” (p. 18). Music also seemed to remind Sam of events or memories in his life, and allowed him to recall very specific details regarding the memory. For example, Sam recalled how a song by Linkin Park called Numb reminded him of the actual sounds and feelings he had when watching his favorite hockey team:

I really liked that and it made me think of the team and how much fun I have there so, sort of, every time I hear that song it reminds me of that...you can hear the pucks hitting the glass...I can picture it.

### *Relieving Stress*

One of Sam’s teachers was more concerned about the level of stress that he was experiencing and putting on himself, rather than whether music listening could improve his attention and concentration: “[Sam is] nervous or high stressed...you know he’s just always worked up about stuff or worried, and not like mad worked up...he puts extra pressure on himself.” Brewer (2007) supported the use of music for both purposes, playing background music as students study, read, or write to help them stay focused for long time periods with little stress. Music helps students to not only focus for longer periods of time, but also produces a

calming effect. Crncec, Wilson, and Prior (2006) also found that background music may calm and focus children with special education needs, thereby enhancing learning.

One of Sam's teachers was also concerned that students would sing along to the words of the song. Sam commented that at times he did sing along to the songs, "In some of the songs I know every word to them." However, when asked if he found that singing distracted him from completing his work, he responded with: "no. Not at all...I don't really sing along to them, I just think of it in my head while I'm doing my stuff...like I don't do that all the time I just do it sometimes." When completing homework or studying for long periods of time, Sam took small mental breaks to listen to the words of his favorite songs. Brewer (2007) also suggested that a 'soundbreak' is useful, where music played to give participants a rest from learning tasks. A quick, energizing activity can recharge students' attention levels. So can a few minutes of rest and relaxation with peaceful music. Once re-energized, students are better able to continue to work effectively (Brewer, 2007). Distraction using pleasant activities to lighten moods is considered to be one of the most advanced and effective ways of mood regulation (Salovey et al., 1999). Saarikallion and Erkkila (2007) found that adolescents appeared to employ music effectively and successfully in diverting themselves from stress, worries and disturbances. Previous research has also demonstrated that pleasant musical activities may help to distance thoughts and feelings from personal burdens (Behne, 1997; Christenson & Roberts, 1998; Christenson et al., 1985; Lull, 1987; Schwartz & Fouts, 2003; Sloboda, 1992). Saarikallion and Erkkila (2007) reported that the distractive power of music may be due to the fact that the adolescents were motivated by musical activities; they considered them interesting and focused on them.

### *Increasing Mood and Self Esteem*

There are many risk factors of ADHD that can lead to emotional and social problems manifesting in adolescence and continuing into adulthood (APA, 2000; Julien, 2005; Trott,

2006). Because of the statistics surrounding the later and sometimes devastating effects of ADHD in adulthood, it is necessary that children and adolescents with ADHD find coping techniques that help them with the negative feelings that may result from their condition. Several researchers have proposed that music may serve as a kind of self-therapy and help people to identify feelings, work through conflicts, and regain control over psychic processes (Behne, 1997; DeNora, 1999; Larson, 1995; Ruud, 1997; Sloboda, 1992; Small, 1998). For Sam, music seemed to help him through times when he may have felt lonely and isolated from his peers, or may have been feeling down. Sam described music as adding *color* to a day which was once filled with dullness: “if you don’t listen to music it’s just talking and silence, but with music there’s sort of color, you know...like color.” Music seemed to put Sam in a better mood: “sometimes I might be down a bit and then I’ll listen to my music and I’ll feel a lot better.”

Saarikallion and Erkkila (2007) found that the importance of music was intrinsically related to enjoyment and positive experiences. Additional research also has demonstrated that people frequently engage in musical activities simply for increasing positive moods, and favorite music is often associated with positive emotions (Lull, 1987; Wells & Hakanen, 1991). It is proposed that pleasures of musical experiences may produce a sense of well-being, stability, wholeness and purpose in life (Larson, 1995; Ruud, 1997). Music can also be an effective means of discharging negative emotions (Lacourse, Claes, & Villeneuve, 2001; Ruud, 1997; Saarikallion & Erkkila, 2007; Schwartz & Fouts, 2003; Sloboda, 1992; Sloboda & O’Neill, 2001).

### *Experience of Time*

I was struck with Sam’s experiences of time when listening to music. He described time as flying by when he ‘zoned out’ while listening to music. Sam also described his day as being more exciting with music, as if music added color to his day. Schonhammer’s (1989)

phenomenological investigation of music listening experiences of individuals using portable music listening equipment (i.e., walkmans, discmans or MP3 players) described the lived experience of space and time as becoming split when using headphones in public places. For example, the world's noises are silenced and replaced with music, which then renders the world in terms of musical rhythm and melodies (Schonhammer, 1989) When listeners live in musical relationship with the world, time becomes the time of music itself, and this causes listeners to “forget about the distance between ‘now’ and ‘then’” (Schonhammer, 1989, p. 141). Nicol (2002) reported similar changes of lived time that were sought by women with chronic illnesses who listened to music. With the right music, objective time was suspended and time seemed to pass unnoticed.

Sam used the phrase ‘zoning out’ as a way to describe his experience and disconnection with time; however, one of Sam’s teachers thought of ‘zoning out’ in class as meaning daydreaming or not doing anything productive. Schonhammer (1989) described the feeling of being "zoned out" as the counterpart to the outsider’s perception of a Walkman user as being present and absent at the same time (Schonhammer, 1989). The idea that a student can be present and absent simultaneously could be disconcerting for a classroom teacher. Unfortunately, this abstract experience of time that music listeners have when using an MP3 player, might heighten resistance from teachers and school systems.

### *Resistance*

Even though portable music players have been apart of our everyday life since the 1980’s, there is still a critical and widespread attitude toward teenagers and the use of MP3 players today. In critical essays on the decline of intellectual culture in modern society the Walkman (MP3 player) often figures as a self-evident illustration (Schonhammer, 1989). Throughout this study and in my previous experiences as a classroom teacher, I encountered many opinions that

questioned the use of music during school hours. Schonhammer (1989) wrote about his own irritation and negative evaluation of the state of mind of the (usually young) users of the Walkman. When he walked down the street and saw an individual with earphones in, he noticed that some people had an instant reaction: “they judge the people with earphones to be dumb, childish, immature, silly, withdrawn, unwilling to communicate, egocentric, narcissistic, autistic, and so forth” (Schonhammer, 1989, p. 129). It is evident that biases towards both popular music and adolescents continue within our culture and our schools.

### *Implications for Practice*

This research has implications for teachers, school administrators, parents, and any individual – child or adult, with ADHD. Implications for studies such as this have the potential to significantly affect the lives of adolescents with ADHD in all of their contexts.

In schools, teachers can use music to assist students in creating a working environment that is catered to their particular needs, and limits the effects of environmental distractions in the classroom. Teacher can also use music to enhance student’s sense of autonomy and personal expression. Music can be a great motivator of thinking and feeling. There are times when this is especially important – for example during reflective times or creative writing. Teachers can also create motivation and inspiration by matching music to the subject of study. Music is readily available, inexpensive and easy to implement in the classroom. Other school professionals such as counsellors, psychologists and nurses, can also make recommendations and advocate for music as a way to increase memory and attention, reduce anxiety and stress, motivate students and reduce disruptive behaviour, and enhance mood and self-esteem through feelings of accomplishment.

For parents, music can provide all of the same benefits at home when completing homework, as it does at school. Music can also provide a way of motivating their child to

complete homework, which in turn may reduce the amount of stress and tension created around their child's academics.

For individuals with ADHD, music can create an environment that is free from auditory environmental distractions when they need to attend and concentrate for long periods of time. Music has the potential to increase memory and attention. By creating an environment that is conducive to work, individuals with ADHD can increase their academic abilities, self-esteem and confidence. Music can also be used to regulate emotion and to manage moods. This is especially significant for adolescents who are in a time of change and puberty when hormones and emotions run high. At times, music is a way for adolescents to define themselves, discover who they are, and express how they are experiencing the world.

#### *Recommendations for Future Research*

This study was not intended to suggest generalizability of results, but to encourage the reader to generate their own connections to the data, and also to inspire further research into discovering more unconventional methods to promote autonomy and self-regulation of individuals with ADHD in school settings. Additional case studies looking at more participants with ADHD over a wider age span will contribute further understanding about whether the effects of listening to music change with age or maturity. The impact of gender and music listening warrants further study, for example, additional case studies of females with ADHD across a wide age span. Since this study only lasted over a 14-week period, it would be interesting to explore the effects of music on young children with ADHD in school, and conduct follow-up studies as the students age. Further research could investigate adults with ADHD, and whether they find success using music in their place of work. Quantitative studies looking at a large sample of adolescents with ADHD may provide statistically significant and generalizable data.

Importantly, throughout this study, it was apparent that classroom teachers and school administrators had difficulty seeing past the pragmatic difficulties of implementing music in the school and the classroom management problems it might create. Research that reports on the successful implementation of music into schools, and that provides pragmatic strategies and exemplary policies, is critical in order to increase schools', teachers', and administrators' receptivity to using music listening in the classroom as way to support academic goals.

### *Conclusion*

This study has brought me full circle, from being a teacher who found success with music in the classroom, to examining the phenomenon from an outsider or researcher's point of view, to again, entering the workforce into a school system that includes many students struggling with ADHD. This research has also brought me from a research frame of mind based on an intrapsychic model to understanding the true complexity of Sam's world through a systemic ecological model. I believe that school personnel's pre-existing biases towards popular teenage culture and the music they choose to listen to and identify with, may lead to a narrow view on the benefits that music can have on the lives of adolescents. Music can increase attention, concentration, memory, mood, self-esteem, and decrease stress. I believe that with this study and with the extensive literature that already exists on ADHD and music, there can be profound implications for professionals and families involved with ADHD. I also hope that further research can provide more insight into the effective uses of music for individuals with ADHD.

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## Appendix A ADHD Diagnostic Criteria

American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders (4th ed., text rev.). Washington, DC: Author.

### Criterion A

Persistent patterns of inattention and/or hyperactivity-impulsivity that is more severe and consistent than individuals within the same developmental level. Either (1) or (2)

#### (1) *Inattention*:

- a) fail to give close attention to details and make careless mistakes
- b) work is messy and careless. Difficulty sustaining attention and completing tasks or play activities.
- c) They appear as if they do not listen and their mind is elsewhere.
- d) They may shift from one uncompleted task to another and have difficulty following through on requests or instructions.
- e) Fail to complete tasks during the diagnosis. Difficulties organizing.
- f) Avoid and dislike activities that require sustained attention, concentration or organizational skills.
- g) Avoidance is due to attention, not attitude. Work is messy, material are usually scattered, lost or damaged.
- h) Easily distracted by irrelevant stimuli
- i) Forgetful in daily activities

#### (2) *Hyperactivity*

- a) Fidgeting or squirming in one's seat.
- b) not remaining seated when expected to do so
- c) Inappropriate running or climbing
- d) difficulty playing quietly
- e) appearing to often be "on the go"
- f) talking excessively
- g) impatience, blurting out.
- h) difficulty waiting one's turn
- i) social, academic, or occupational difficulties because of interrupting or intruding on others.

### Criterion B

Symptoms that cause impairment must be present before age 7

### Criterion C

Some impairment from the symptoms must be present in at least two settings (eg. At home and at school)

### Criterion D

Developmentally appropriate social, academic, or occupational functioning must be clearly interfered.

### Criterion E

The disturbance does not occur exclusively during the course of a Pervasive Developmental Disorder, Schizophrenia, or other Psychotic Disorder and is not better accounted for by another mental disorder (eg. A Mood Disorder, Anxiety Disorder, Dissociative Disorder, or Personality Disorder).

### Subtypes

#### *Attention-Deficit/Hyperactivity Disorder, Combined Type*

If both Criteria A1 and A2 are met for the past 6 months

#### *Attention-Deficit/Hyperactivity Disorder, Predominately Inattentive Type*

If Criterion A1 is met but Criterion A2 is not met for the past 6 months

#### *Attention-Deficit/Hyperactivity Disorder, Predominately Hyperactive-Impulsive Type*

If Criterion A2 is met but Criterion A1 is not met for the past 6 months.

\* For individuals who currently have symptoms that no longer meet full criteria (usually adolescents and adults), they are specified as “In Partial Remission.”

### Associated Features and Disorders

Low frustration tolerance, temper, outbursts, stubbornness, excessive and frequent insistence that requires to be met, mood lability, demoralization, dysphoria, rejection by peers, and poor self-esteem.

### Specific Culture, Age, and Gender Features

- Is known to occur in various cultures
- It is difficult to diagnose in children younger than 4 or 5 years because of developmental behaviours present that are similar to ADHD.
- More frequent in males than in females (2:1 – 9:1)
- Social dysfunction in adults appears to be especially likely in those who had additional concurrent diagnosis in childhood.

### Prevalence

- 3%-7% in school-aged children

### Course

- Usually diagnosed during elementary school years.
- Inattentive Type children may not come to clinical attention until late childhood.
- The disorder is relatively stable throughout adolescence.
- Symptoms usually diminish during late adolescence and adulthood.
- A minority of individuals experience the full complement of symptoms.
- Other adults may retain only a few symptoms: classified as In Partial Remission.

### Familial Pattern

- Biology: ADHD has been found to be more common in the first degree biological relatives. Strong influence of levels of hyperactivity, impulsivity, and inattention.
- Social: family, school, and peer influences.
- High prevalence of Mood and Anxiety Disorders, Learning Disorders, Substance-Related Disorders, and Antisocial Personality Disorder in family members of individuals with ADHD.

### Differential Diagnosis

- Age-appropriate behaviours in active children
- Mental Retardation
- Understimulating environments

- Oppositional behaviour
- Stereotypic Movement Disorder
- Another mental disorder (eg. Mood Disorder, Anxiety Disorder, Dissociative Disorder, Personality Disorder, Personality Change due to a general medical condition, or a Substance-Related Disorder)
- Pervasive Developmental Disorder
- Psychotic Disorder
- Other Substance-Related Disorder Not Otherwise Specified

## Appendix B Parent Interview Questions

### Pre-Study Interview Questions for Parents

1. Describe your son.
2. How did you become aware that your son may have Attention-Deficit/Hyperactivity Disorder?
3. How did you feel when his differences came to your awareness?
4. How did you react or feel when your son was officially diagnosed?
5. How has the disorder affected his behaviour at home?
6. What adaptations or changes (if any) have you had to make at home for your son to accommodate his diagnosis?
7. How do you feel about your son's education?
8. How does he handle the work load of school?
9. What types of routines does your son usually employ when completing homework?
10. Does your son receive assistance when completing homework?
11. What would you like to see change for him at school?

### Mid Point Interview Questions for Parent

1. How has the last month been for you and your son?
2. Do you have any concerns or changes you feel should be made to the study to alter the last half of the research?
3. Do you have any other pertinent documents or accounts you want to share?

### Post-Study Interview Questions for Parents

1. Have you seen any changes within your son during the past three months?
2. Have your son's attitudes towards school and the work that is involved changed?
3. Did your sons use the walkman at home when he was completing homework?
4. What are your attitudes and views about listening to music, and the study?
5. Has he said anything? Done anything differently?

Appendix C  
Adolescent with ADHD Interview Questions

Pre-Study Interview Questions for Adolescent with ADHD

1. Describe what it was like to be diagnosed with Attention-Deficit/Hyperactivity disorder?
2. How did you deal with ADHD when you were first diagnosed? How do you feel about it now?
3. Describe what life is like for you at school?
4. What types of strategies are you currently using in school to manage? What have you tried in the past?
5. How do you normally study, or complete homework?
6. Do you think having ADHD affects your attitude towards school?
7. What do you think about my study?
8. What do you think about the use of music in school?
9. What types of music do you currently listen to outside of school?
10. Describe to me how you feel when you listen to music. What is your experience of time and space?

Mid Point Interview Questions for Adolescent with ADHD

1. How has the last month been for you in the classroom?
2. Are you comfortable in the classroom listening to music?
3. Do you think that we should change anything in the study for the second half? What is working? What isn't working?
4. What types of music are you listening to? Do you find it easier or harder to focus with different types of music?
5. Do you have any other pertinent documents or accounts you want to share?

Post-Study Interview Questions for Adolescent with ADHD

1. Was listening to music in the classroom beneficial? How is it different from when you are not listening?
2. Would you like to continue using the technique in the future?
3. How do you feel the music listening sessions affected your studies and the quality of your work?

4. What type of music did you chose to listen to?
5. Did you find a difference in the type of music you listened to (rock, pop, rap, and so on)?
6. Where you aware of your body as you listened to music?
7. What thoughts went through your mind as you listened to music?
8. Were you aware of your environment when you listened to music? Or were you distracted by the music?
9. What advice would you give to other students with ADHD who are finding it difficult to sustain attention within the classroom?
10. What has this study has done for you and your understanding of your diagnosis?

## Appendix D

### Instructions for Music Listening Sessions

- Listening sessions may be during:
  - Classroom time
  - Homework (after school)
  
- Things to focus your attention on:
  - What is your awareness of the classroom (or home) environment when you are listening to music? Are you more, less, or have the same amount of awareness of things/people/noises/etc. around you?
  - What about listening to music *is* working for you?
  - What about listening to music is *not* working for you?
  - What types of music are you listening to?
  - Do certain types of music allow you to concentrate and focus more than others?
  - Are assignments being completed more or less efficiently when listening to music?
  - Is the quality of the assignments completed while listening to changing?
  - Does your attitude or opinion of the assignment change while listening to music?
  
- You may find it helpful to keep a journal of thoughts, ideas, or feelings that you have after a music listening session.

## Appendix E Teacher Interview Questions

### Pre-Study Interview Questions for Teachers

1. What can you tell me about Attention-Deficit/Hyperactivity Disorder?
2. Describe the adolescent participant with ADHD for me.
3. What teaching strategies are you currently utilizing in the classroom?
4. What strategies or modifications (if any) are you providing in the classroom, and/or assignments for the student with ADHD?
5. Which strategies have you used in the past?
6. How is the student with ADHD currently doing in his class?
7. Describe his work ethic, and behaviour in the classroom.

### Mid Point Interview Questions for Teachers

1. How has the last month been for you and your class?
2. Are any of the other students concerned with the adolescent being able to listen to music in class? What are some of the comments and/or concerns?
6. Do you have any concerns or changes you feel should be made to the study to alter the last half of the research?
7. Do you have any other pertinent documents or accounts you want to share?

### Post-Study Interview Questions for Teachers

1. What were your impressions of the sessions with respect to the atmosphere of the classroom?
2. Do you feel that the student with ADHD's attention and concentration was affected in anyway when he listened to music?
3. Did the amount and/or quality of work that he completed when listening to music change?
4. What suggestions or revisions do you have for subsequent sessions or future applications?
5. Can you comment on benefits and disadvantages of the use of music in the classroom?
6. Describe how you feel about the use of music in the classroom?
7. Do you think you will continue to allow the student, and any future students with ADHD to listen to music during individual seatwork in the classroom?

## Appendix F Attention Checklist

### Attention Checklist

**Instructions:** Listed below are questions about the child's behavior. Place a circle around the number in the column which best describes this child. Answer all items.

<i>Observations</i>	<i>Not at All</i>	<i>Just A little</i>	<i>Pretty Much</i>	<i>Very Much</i>
1. Does the child have a short attention span?	4	3	2	1
2. Does the child appear detached from classroom activities?	4	3	2	1
3. Does the child accurately heed directions?	1	2	3	4
4. Does the child daydream in class?	4	3	2	1
5. Does the child have trouble concentrating?	4	3	2	1
6. Does the child stay with one activity long enough to complete it?	1	2	3	4
7. Does the child work independently?	1	2	3	4
8. Is the child easily distracted?	4	3	2	1
9. Is the child able to concentrate on a task until completed?	1	2	3	4
10. Does the child listen attentively?	1	2	3	4
11. Does the child become easily engrossed in an activity?	1	2	3	4
12. Does the child disregard some or all directions?	4	3	2	1

# Appendix G Ethics Approval



University of Saskatchewan  
Behavioural Research Ethics Board (Beh-REB)

11-Aug-2006

## Certificate of Approval

PRINCIPAL INVESTIGATOR  
Jennifer J. Nicol

DEPARTMENT  
Educational Psychology and Special Education

BEH#  
06-203

STUDENT RESEARCHERS  
Joni Wiebe

INSTITUTION(S) WHERE RESEARCH WILL BE CONDUCTED (STUDY SITE)  
University of Saskatchewan  
Saskatoon SK

SPONSOR

TITLE  
ADHD and Music: A Case Study

CURRENT APPROVAL DATE  
10-Aug-2006

CURRENT RENEWAL DATE  
01-Jul-2007

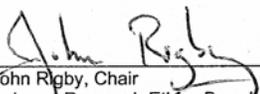
The University of Saskatchewan Behavioural Research Ethics Board has reviewed the above-named research project. The proposal was found to be acceptable on ethical grounds. The principal investigator has the responsibility for any other administrative or regulatory approvals that may pertain to this research project, and for ensuring that the authorized research is carried out according to the conditions outlined in the original protocol submitted for ethics review. This Certificate of Approval is valid for the above time period provided there is no change in experimental protocol or consent process or documents.

Any significant changes to your proposed method, or your consent and recruitment procedures should be reported to the Chair for Research Ethics Board consideration in advance of its implementation.

### ONGOING REVIEW REQUIREMENTS

The term of this approval is five years. However, the approval must be renewed on an annual basis. In order to receive annual renewal, a status report must be submitted to the REB Chair for Board consideration within one month of the current expiry date each year the study remains open, and upon study completion. Please refer to the following website for further instructions: <http://www.usask.ca/research/ethical.shtml>

APPROVED

  
Dr. John Rigby, Chair  
Behavioural Research Ethics Board  
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