Implementation of an Attention Training Program with Children with Attention Deficit Hyperactivity Disorder in South Africa

Abigail Gillian Wilson
WLSABI001

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COMPULSORY DECLARATION

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works, of other people has been attributed, and has been cited and referenced.

Signature:_____ Date:_____

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ABSTRACT

Attention Deficit/Hyperactivity Disorder (ADHD) is a group of behavioural symptoms that include inattentiveness, hyperactivity and impulsiveness and tends to be the most commonly diagnosed childhood behavioural disorder. The aim of this study was to determine the feasibility of the Pay Attention! Intervention with a small group of children diagnosed with ADHD as compared to matched controls. The intervention focused on sustained, selective, alternating and divided attention. After a baseline evaluation, five children aged 6 to 8 years were assigned to receive bi-weekly Pay Attention! sessions for 12 weeks and five matched controls were assigned to a Test-only group. Participants completed an outcome evaluation approximately 12 weeks after their baseline evaluation, both of which included neuropsychological and behavioural (both parent and teacher) assessments. Results show that the intervention is feasible to administer and acceptable to participants. Although no significant treatment effects were found on the neuropsychological outcomes and for the teacher ratings of ADHD, there were however significant effects found on parent ratings of ADHD symptoms on the Child Behaviour Checklist and the Vineland Adaptive Behaviour Scale-II. These preliminary findings add to the growing body of literature on attention training interventions for children with ADHD. However, a randomised controlled trial is warranted to further investigate the specific use of the Pay Attention! intervention with this population in the South African context.

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CHAPTER 1: INTRODUCTION

Attention Deficit/Hyperactivity Disorder (ADHD) is a highly prevalent, clinically heterogeneous disorder that often results in financial liabilities and other stressors for families, and in adverse academic and vocational outcomes for the diagnosed individual (Carroll et al., 2006). ADHD is considered to be the most commonly diagnosed childhood behavioural disorder as well as the most common neurodevelopmental disorder of childhood (Rowland, Lesesne, & Abramowitz, 2002; Tamm et al., 2010). Compared to children of the same level of development, a child with ADHD experiences a pattern of diminished sustained attention as well as higher than expected levels of impulsivity (Sadock & Sadock, 2007). Given that children with ADHD experience a diminished capacity to sustain attention, attention training is considered to be a promising treatment approach for ADHD (Tamm, Epstein, Peugh, Nakonezny, & Hughes, 2013).

Attention training is an intervention that forms part of cognitive rehabilitation. The various components of attention training are skills that can be improved with repetitive practice (Tamm et al., 2013). In the last decade researchers have investigated the effectiveness of attention training as an intervention for ADHD, and the literature providing support for such interventions is growing (Kerns, Eso, & Thomson, 1999; Semrud-Clikeman et al., 1999; Tamm et al., 2010, 2013; Williams, 1989). The results of these studies show that there is an improvement in the cognitive skill being trained directly, as well as an improvement in untrained skills (i.e. those skills not trained during the interventions), for example, untrained measures of attention and academic efficiency as a result of generalization of treatment effects. In addition, teachers and parents have reported a reduction in observed ADHD symptoms such as inattention-impulsivity and hyperactivity (Kerns et al., 1999; Semrud-Clikeman et al., 1999; Tamm et al., 2010, 2013; Williams, 1989).

Despite ADHD being one of the most common neurobehavioural disorders in children, there is little empirical research that has been published on ADHD in an African context. This study will therefore focus on attention training as an intervention for South African children with ADHD based on international literature that supports this type of intervention (Kerns et al., 1999; Semrud-Clikeman et al., 1999; Tamm et al., 2010, 2013; Williams, 1989).

Aim of the present study

The aim of this study is to serve as a pilot study for a larger future study in order to investigate the feasibility of implementing the Pay Attention! intervention for South African children aged 6 to 8 years old from low to middle socioeconomic status (SES) backgrounds who have been diagnosed with ADHD. The feasibility of the Pay Attention! intervention is discussed in terms of time commitments, content of the intervention and participants' and their parents' comments.

Outline of the thesis

Chapter 2 will review the literature on ADHD, with particular attention being given to the historical perspective of ADHD, the classification of ADHD, and attention training as a treatment intervention for children with ADHD. Chapter 3 will describe the methodological approach used by the current research, while Chapter 4 will detail the results of the data analysis. Chapter 5 will provide a discussion of the results, the strengths and limitations of the current research, and recommendations for future research.

CHAPTER 2: ATTENTION DEFICIT HYPERACTIVITY DISORDER

Introduction

The present chapter provides a broad overview of the history, classification and effects of ADHD, epidemiology, a definition of attention as well as current treatment interventions available. This historical and theoretical perspective on ADHD serves as a backdrop to understanding the motivation behind the implementation of cognitive rehabilitation programmes for individuals with ADHD, and in particular, attention training.

History of ADHD

Literature dating back to the early 1900's has identified ADHD under a variety of terms or descriptions (Sadock & Sadock, 2007). In 1902, George Still M.D. presented a series of lectures in which he described the lack of moral control amongst children who did not present with any distinguishing physical impairment (Barkley, 1990). Several years later, the encephalitis epidemic of 1917-1918 resulted in early attempts to link attention deficits and behavioural disturbances to brain dysfunction (Rowland et al., 2002). Children who survived the encephalitis epidemic, experienced subsequent problems, including hyperactivity, personality changes, and learning difficulties (Rowland et al., 2002). In later research, impulsive, disinhibited and hyperactive children, many of whom had neurological damage caused by encephalitis, were grouped under the label hyperactive syndrome (Sadock & Sadock, 2007).

In 1968, hyperkinetic reaction of childhood (now referred to as ADHD) was included in the American Psychiatric Association's Diagnostic Statistic Manual-II (DSM), characterised by symptoms of excessive motor activity (Epstein & Loren, 2013). In 1980 when the DSM-III was published, the disorder was renamed Attention Deficit Disorder with and without hyperactivity with the focus on problems with attention, impulsivity and hyperactivity (Epstein & Loren, 2013; Sadock & Sadock, 2007). With the release of the

revised version of the DSM-III, attention deficit disorder with and without hyperactivity was eliminated and the term ADHD was introduced (Epstein & Loren, 2013; Sadock & Sadock, 2007). In the DSM-IV, the term ADHD was retained and three specific subtypes of the disorder were introduced. These subtypes included predominantly inattentive, predominantly hyperactive/impulsive, and combined inattention with hyperactivity and impulsivity (APA, 2000; Epstein & Loren, 2013).

In preparation for publication of the DSM-5, the definition of ADHD and the subtype classifications that were presented in the DSM-IV-TR ('text revision' of the DSM-IV in which the specific criteria for diagnosis were unchanged but the text sections giving extra information on each diagnosis were updated) were the subject of ongoing debate and criticism (APA, 2000; Nigg, Tannock, & Rohde, 2010). Research on the ADHD subtypes presented in the DSM-IV-TR suggested that these subtypes were unstable over time; children who met criteria for the diagnosis of one subtype at a particular point often failed to meet the same criteria at a later time, and still later may even be diagnosed with another subtype altogether (Nigg et al., 2010; Willcutt et al., 2012).

With the release of DSM-5 in 2013 there were several modifications to ADHD diagnostic criteria. As with the DSM-IV-TR, symptoms of ADHD are divided into two categories of inattention, and hyperactivity and impulsivity. However, the subtypes presented in DSM-IV-TR are now referred to as presentations. Children must have at least six symptoms from either or both the inattention group of criteria and the hyperactivity and impulsivity criteria (APA, 2013). The onset of symptoms and impairments has changed from before the age of 7 years to before the age of 12 years. The criteria for ADHD have not changed in the DSM-5, however additional examples have been included to illustrate the types of behaviour children, older adolescents and adults with ADHD may exhibit. The descriptions will help clinicians better identify typical ADHD symptoms at each stage of a

person's life (APA, 2013). The DSM-5 no longer includes exclusion criteria for people with autism spectrum disorder since symptoms of both disorders (i.e. inattention, and/or hyperactivity/impulsivity) co-occur (APA, 2013; Epstein & Loren, 2013). Overall, these revisions of the ADHD classification scheme in DSM-5 are more modest than in earlier updates of DSM.

As noted, symptoms of ADHD are organised into two categories according to the DSM-5: inattention and hyperactivity/impulsivity (APA, 2013). Behavioural deficits in line with these two categories are present relatively early in childhood (typically before the age of 12 years), and persist throughout the lifetime. The DSM-5 recognizes three subtypes of ADHD: Predominantly Inattentive Type (ADHD-PI), Predominantly Hyperactive/Impulsive Type (ADHD-HI), and Combined Type (ADHD-CT).

ADHD-PI. Individuals with the ADHD-PI subtype can be characterized as having difficulties in organizing or finishing tasks, executing daily routines, sustaining attention in tasks or play activities, paying attention to details, and following instructions or conversations. An individual with ADHD-PI may also misplace things necessary for tasks and activities and may also be forgetful in daily activities.

ADHD-HI. Individuals with the ADHD-HI subtype typically show the following hyperactive behaviour patterns: fidgeting and talking excessively, and being unable to sit still (e.g., for a meal or while doing homework; younger children may run, jump, or climb constantly). Individuals with this subtype also tend to show the following characteristics related to impulsivity: interrupting others, grabbing objects, and making inappropriate verbal outbursts. For instance, children may find it difficult to wait their turn or to listen to directions, and impulsive behaviour may also lead to them sustaining more injuries and accidents than others.

ADHD-CT. Individuals with the ADHD-CT subtype are characterized by symptoms of both ADHD-HI and ADHD-PI, with symptoms of both types equally predominant.

Appendix A presents a complete description of the DSM-5 diagnostic criteria for ADHD.

Definition and Diagnosis of ADHD

ADHD is a chronic condition that is characterised by persistent inattention, hyperactivity, impulsivity, distractibility, and a low tolerance for frustration (APA, 2013; Papalia, Olds, & Feldman, 2009; Sternberg, 2009). For a diagnosis of ADHD to be confirmed, impairment as a result of attention and/or hyperactivity needs to be observable in at least two settings, such as at home, school and/or work (where relevant) (APA, 2013). In addition, the impaired attention and/or hyperactivity must be deemed to interfere with age appropriate developmental and social functioning, academic or occupational ability, or in extracurricular activities (APA, 2013; Kerns et al., 1999; Sadock & Sadock, 2007). Despite many of the symptoms being present by age 3, a large number of children are not actually diagnosed before the age of 7 years as this tends to be the age when their behaviours cause problems in school and other places (Sadock & Sadock, 2007). In order for a diagnosis of ADHD to be made, the symptoms cannot occur exclusively during the course of schizophrenia or another psychotic disorder, and cannot be better explained by another mental disorder (i.e., mood disorder, anxiety disorder, dissociative disorder, personality disorder, substance intoxication or withdrawal) (APA, 2013).

Co-morbid psychiatric conditions and ADHD. ADHD is often associated with co-morbid conditions such as psychiatric disorders (for example anxiety and oppositional defiant disorder), learning disabilities, and other developmental disabilities such as intellectual disability and autism spectrum disorder (ASD) (APA, 2013; Kube, Petersen, & Palmer, 2002; Schatz & Rostain, 2006). In a study conducted by Kube et al. (2002) to identify the

relationships between referral complaints of ADHD, behaviour problems or learning problems, the researchers found that children referred for an evaluation of ADHD or learning problem often had a co-morbid psychiatric disorder. Approximately 20-25% of children with ADHD meet criteria for a learning disorder, but learning disorders appear to be independent of ADHD (Gilberg et al., 2004). It is estimated that 20-50% of children with ADHD meet criteria for ASD while 30-80% of children with ASD meet criteria for ADHD (Rommelse, Franke, Geurts, Hartman, & Buitelaar, 2010). Anxiety and oppositional defiant disorder (ODD) are two of several disorders that may have overlapping features of ADHD and may be mistaken for this condition (APA, 2013; Kube et al., 2002; Sharma & Couture, 2014). These two disorders will be discussed with the view that they tend to be the most common co-morbid conditions.

ADHD and co-morbid anxiety. Approximately 25% of children with ADHD meet the criteria for co-morbid anxiety disorder (Mikami, Ransone, & Calhoun, 2011; Schatz & Rostain, 2006; Sorensen, Plessen, Nicholas, & Lundervold, 2011). The presence of anxiety may partially inhibit the impulsivity and response inhibition deficits seen in ADHD (Schatz & Rostain, 2006; Sorensen et al., 2011). However, anxiety may also make working memory and other cognitive deficits worse (Schatz & Rostain, 2006).

ADHD and co-morbid ODD. ADHD and ODD symptoms, especially interpersonal sensitivity and emotional reactivity, are highly co-morbid (Scholtens, Diamantopoulou, Tillman, & Rydell, 2012). It is estimated that almost all children under the age of 12 years who meet the criteria for diagnosis of ODD will also meet the criteria for ADHD-CT (APA, 2013; Scholtens et al., 2012; Selekman, 2002). Approximately a quarter of children who meet the criteria for ADHD-PI may also meet the criteria for ODD (APA, 2013).

As a result of these co-morbid conditions much controversy exists regarding ADHD diagnoses and treatment as these developmental or medical disorders mimic the symptoms of

ADHD (Kube et al., 2002), which can lead to misdiagnoses. Such inaccuracies over time can affect the estimated prevalence rate of ADHD.

Epidemiology of ADHD

Prevalence. Despite ADHD being the most common and most studied neurodevelopment disorder of childhood, basic epidemiologic information about the distribution of ADHD across the population by age, sex, race and socio-economic status remains poorly described (Polanczyk et al., 2007; Rowland et al., 2002). However, recent systematic reviews report that ADHD prevalence estimates vary from 2 to 20 percent (Perold, Louw, & Kleynhans, 2010; Rowland et al., 2002). The prevalence rate in the United States of America is estimated to be 5% to 8% of children (Spencer, Biederman, & Mick, 2007). At this stage, specific figures on the prevalence of ADHD amongst South African children are unavailable. However, the prevalence rate of ADHD in South Africa is thought to correspond with that of the United States and Europe with estimates of up to 10% of children in South Africa experiencing symptoms associated with ADHD (Flischer, Hatherill, Lund, Funk, & Patel, 2009; Perold et al., 2010).

Polanczyk et al. (2007) conducted a comprehensive systematic review of studies on worldwide ADHD prevalence rates and found that low-middle income countries (in Africa and the Middle East) appear to have lower prevalence rates of ADHD than high-income countries (North America and countries in Europe). However, these findings should be carefully interpreted, as these geographic areas (Africa and the Middle East) only contributed 8 studies to the overall analysis of 102 studies. A possible reason for the variation in prevalence estimates is that the majority of investigations on ADHD have been generated in North America and some western European countries (Adewuya & Famuyiwa, 2007; Farone, Sergeant, Gillberg, & Biderman, 2002). The differing rates of ADHD between different countries may reflect different diagnostic criteria, age range assessed, information sources

and impairment definition (Adewuya & Famuyiwa, 2007; Farone et al., 2002; Rohde et al., 2005; Rowland et al., 2002).

Another possible reason the prevalence estimates may vary is that ADHD diagnoses are heavily dependent on parent and teacher reports which are sensitive to what is asked by whom, and how this information is combined (Rowland et al., 2002). However, there tends to be a low agreement between different informants such as parents, teachers and clinicians (Sollie, Larsson, & Mørch, 2012). The choice of parent informant has implications since mothers appear to rate their children as having more problems than the fathers and the teachers do on behaviour scales such as the Child Behaviour Checklist and ADHD-Rating Scale-IV (Sollie et al., 2012). The teacher's understanding and view of ADHD is also of vital importance to early identification and management of the disorder (Coles et al., 2012). However, there is no specific recommendation listed in the DSM-5 (APA, 2013) on how to handle cross-informant disagreement.

Further, primary care providers other than psychologists or psychiatrists (i.e. school nurses, community clinic nurses, general practitioners and paediatricians) may often diagnose ADHD. These primary care providers may not always diagnose the disorder according to the DSM-5 diagnostic criteria, rather basing their diagnosis on "clinical intuition", which may affect the prevalence estimates (Boyle et al., 1996; Polanczyk et al., 2007; Rowland et al., 2002; Wasserman et al., 1999). Hence, there are concerns that ADHD is perhaps over diagnosed or misdiagnosed. It would therefore be necessary, when considering a possible diagnosis of ADHD, to take into account whether the individual presents with any of the risk factors for ADHD.

Risk factors. While the exact causes of ADHD are unknown, the results of various studies show that certain factors (e.g., sex, family history and environmental factors) are associated with increased vulnerability to an ADHD diagnosis.

Sex. Boys tend to be diagnosed with ADHD more than girls, with the ratio of diagnoses ranging from 2:1 to as much as 9:1 (Coles, Slavec, Bernstein, & Baroni, 2012; Sadock & Sadock, 2007). Boys with ADHD combined type are at greater risk of developing mood disorders, while girls with ADHD inattentive type tend to be more likely to have a co-morbid anxiety disorder (Bauermeister et al., 2007). Boys with ADHD also tend to be at greater risk of school suspension and/or expulsion since boys tend to present with higher rates of disruptive behaviour disorders (ODD and Conduct Disorder) (Bauermeister et al., 2007). This is because boys' behaviour results in higher rates of annoyance or distress to teachers and more problems with their schoolwork relative to girls (Bauermeister et al., 2007). Boys tend to generate higher ratings of hyperactive and inattention symptoms compared to girls matched for age, by both parents and teachers (Coles et al., 2012).

Family history. ADHD is considered to be a heritable disorder with family and twin studies indicating a risk to first-degree relatives in the order of five- to tenfold the population rate (Asherson, 2010; Sadock & Sadock, 2007). These family and twin studies did not exclude the importance of environmental factors; in most cases genetic factors interact with environmental factors resulting in ADHD (Asherson, 2010; Mill & Petronis, 2008).

Environmental factors. Epidemiological evidence exists linking the exposure to various environmental factors, either prenatally or in early development, with an increased risk of ADHD (Mill & Petronis, 2008). Examples of specific in utero environmental risk factors include prenatal exposure to nicotine and recreational drugs, pre- and neonatal exposure to toxins such as hexachlorobenzene (a fungicide used in wheat products), and maternal stress and poor maternal diet during pregnancy (Banerjee et al., 2007; Mills & Petronis, 2007).

Premature birth and/or very low birth weight (less than 2500 grams) result in a two- to three-fold risk for ADHD (APA, 2013; Amor et al., 2005). In addition, children with ADHD

tend to have experienced a higher prevalence of stressful events in early life with neonatal admission to hospital, having been in an incubator, having received oxygen therapy or general anaesthesia, and having undergone surgery, being the most frequent (Amor et al., 2005).

With an understanding of the definition of ADHD and the possible characteristics and risk factors for an individual with ADHD I will now discuss attention as a construct. As mentioned, ADHD is characterised by, amongst other things, persistent inattention. Several studies suggest that children with ADHD have a primary deficit in the ability to sustain attention over a period of time (Hooks, Milich, & Lorch, 1994; Prinz, Tarnowski, & Nay, 1984; Seidel & Joschko, 1990). What is not clear is whether children with ADHD experience a specific difficulty with selective attention (Hooks et al., 1994; Kerns et al., 1999). To understand the differences between the components of attention, such as sustained attention and selective attention, attention will now be defined.

Attention

Attention can be defined as the mechanisms by which an individual appropriately responds to relevant stimuli, including their awareness of the world and conscious thought and emotions in response to their surroundings (Coull, 1998; Posner & Rothbart, 2007; Tamm et al., 2013). Attention is not a unitary construct and several models exist outlining the major and multidimensional components of attention and their underlying neurological structures (Coull, 1998; Kerns et al., 1999; Kim et al., 2008; Posner & Rothbart, 2007; Sohlberg & Mateer, 1987). Regardless of the model one adopts, most models of attention include separable components of attention, for example, the ability to sustain attention over a period of time, the ability to selectively attend to stimuli, the ability to switch attention between two things, and the ability to divide attention in order to maintain more than one process at a time (Thomson, Kerns, Seidenstrang, Sohlberg, & Mateer, 2005).

One such model, which will be used in the current study, is the clinical model of attention put forward by Sohlberg and Mateer (1987). These authors suggested that attentional capacity is hierarchical in nature. By hierarchical they mean that in order to be able to succeed in tasks that require higher levels of attention, such as alternating or divided attention, the lower levels of attention are necessary, such as focusing and sustaining attention. The higher order levels of attention are not only dependent on these underlying skills and levels of attention, but also on executive abilities such as the ability to inhibit and disengage attention (Sohlberg & Mateer, 1987; Thomson et al., 2005).

Five domains of attention are set out in Sohlberg and Mateer's (1987) model. These domains are described in order from the least to most resource intensive, and include: focused attention, sustained attention, selective attention, alternating attention and divided attention.

Focused attention is not relevant in the current study as it is usually disrupted in individuals who experience lower levels of consciousness, for example when emerging from a coma (Sohlberg & Mateer, 1987). Hence this domain will not be discussed.

Sustained attention. Sustained attention refers to the ability to attend to one stimulus during continuous and repetitive activity over a period of time (Coull, 1998; Thomson et al., 2005). This construct of attention includes the concepts of vigilance and persistence. Sustained attention is necessary for most classroom work, for example, reading silently and completing worksheets. Should a child with ADHD experience impaired sustained attention they may have difficulty paying attention to detail and as a result make careless mistakes leading to fluctuations in task performance over time (Anderson, Anderson, & Anderson, 2006; Sadock & Sadock, 2007; Sternberg 2009).

Selective attention. Selective attention is the ability to make choices regarding which stimuli to pay attention to and which to ignore, in other words, to attend to target stimuli and to inhibit responses from non-target stimuli (Sternberg, 2009; Thomson et al.,

2005). Selective attention skills are necessary for a student to be able to listen to the teacher while there are background noises, such as children playing outside (Thomson et al., 2005). Should selective attention be impaired in a child with ADHD, the child will be easily distracted by irrelevant sights and sounds. This distraction will in turn lead to difficulty resisting compulsions that are not related to the current task and the child will have difficulty maintaining focus (Sohlberg & Mateer, 1987).

Alternating attention. Alternating attention allows an individual to switch between different tasks with ease (Sternberg, 2009). Alternating attention skills are required when one has to stop one task and begin another, or to switch rapidly between one or more tasks (Thomson et al., 2005). Should alternating attention be impaired in a child with ADHD, the child may experience difficulty with a task that requires looking at a picture and then answering questions on a worksheet related to the picture (Sohlberg & Mateer, 1987).

Divided attention. When confronted with multiple stimuli at one time, one uses divided attention in order to attend to all the stimuli simultaneously (Sternberg, 2009). A child with ADHD may have persistent academic difficulties if they are unable to focus their attention on multiple tasks at one time, resulting in tasks being below optimal quality or incomplete. This may, for example, affect a child's ability to listen to the teacher and to write down the teacher's instructions at the same time (Sohlberg & Mateer, 1987; Thomson et al., 2005).

The processes associated with the previously described domains of attention are thought to be the building blocks underlying executive function (Coull, 1998). In addition to difficulties with attention, deficits on one or more areas of executive function are also a characteristic feature in children with ADHD.

Executive Function

Executive function refers to self-regulatory behaviours necessary to select and sustain actions as well as guide behaviour within the context of goals or rules (Mahone et al., 2002a). Executive function involves developing and implementing approaches to performing tasks that are not habitually performed. Inhibition of inappropriate thought or behaviour, shifting of thought, initiation, working memory, planning, organisation, and the ability to efficiently sustain and monitor behaviour are crucial elements of executive function (Gioia, et al., 2000).

In theory, more efficient attentional processes should give rise to enhanced executive processes such as inhibition, task management, planning and working memory. Furthermore, more efficient executive function may translate into improvements in behaviour, for example, improved inhibition might lead to better self-regulation.

The construct of executive function is especially important in children, as it is considered to be central in successful acquisition and efficient use of academic skills. Children generally demonstrate major periods of gain on measures of executive function during the school years (Mahone et al., 2002b). Investigators have compared children with ADHD to controls on domains of executive function using IQ as a measure (Sergeant, Guerts, & Oosterlaan, 2002). There were no significant group differences on measures of executive function at high average or superior IQ levels. However, clinical measures of executive function may differ among children with ADHD at extremely low, borderline, low average and average levels of IQ (Mahone et al., 2002b). In separate studies, when compared to typically developing children, when age and IQ were controlled for, children with ADHD tended to perform significantly worse on assessment of working memory (Alloway & Cockcroft, 2014; Cockroft, 2011).

Other cognitive domains. Besides attention and executive function domains, neuropsychological studies of children with ADHD have also indicated impairments in

memory, reaction time and information processing speed, and visuomotor ability (Gualtieri & Johnson, 2007; Kerns et al., 1999; Marconi, 2010; Roth et al., 2004). Some of these impairments may, however, be subserved by difficulties in attention and executive function described before.

ADHD does not only affect an individual on a cognitive level, but behavioural and interpersonal difficulties may also be present.

Behavioural and Interpersonal Effects of ADHD

In addition to effects on cognitive domains, children with ADHD tend to shout out during class, get out of their seat without permission, be non-compliant, and fail to complete assignments, resulting in a great deal of disruption in the classroom (Coles et al., 2012). These disruptions in the classroom place children at increased risk for poor outcomes in academic achievement, lower rates of completing high school, and increased use of special education services (Coles et al., 2012; Kerns et al., 1999; Rutledge, van den Bos, McClure, & Schweitzer, 2012). For these reasons, children with ADHD also tend to require more supervision from parents or teachers when completing tasks than a child who does not have ADHD (Tucha et al., 2011).

In terms of mental and emotional effects, the negative consequences associated with ADHD include a high risk of developing adjustment problems and other psychiatric disorders, elevated levels of antisocial behaviour, low self-esteem and problems with social relationships (Sharma & Couture, 2014; Mill & Petronis, 2008; Rutledge et al., 2012).

It is therefore clear that ADHD presents significant challenges, not only for the child but for parents and teachers as well. Parents with ADHD have a particular need for relevant and accessible information in terms of understanding and adjusting to their child's diagnosis and treatment (Sciberras, Iyer, Efron, & Green, 2010).

Approximately 60% to 80% of ADHD symptoms persist into adulthood and thus ADHD is not just a childhood disorder that spontaneously resolves during adolescence (Sharma & Couture, 2014). Possible manifestations of ADHD in adults may include inferior job performance, lower socioeconomic status and marital/relationship difficulties (Sharma & Couture, 2014).

The social and economic effects of childhood ADHD are considerable, and the difficulties can often persist into adulthood (APA, 2013; Mill & Petronis, 2008). In light of these negative effects and possible experiences of lower quality of life in individuals with ADHD, additional treatment interventions are necessary, particularly in childhood. Early and effective treatment of ADHD yields a better prognosis and fewer difficulties in adulthood as well as providing a reprieve to parents and siblings, teachers and classmates (Sharma & Couture, 2014).

Treatment for ADHD

Most often, the treatment of choice for ADHD is a combination of psychotherapy and medication (Sternberg, 2009). Pharmacological treatment of children with ADHD has been shown to be successful; however medication alone does not normalise attention functions (Gualtieri and Johnson, 2008; Tucha et al., 2011). Although medication is a useful treatment tool for ADHD, the best outcomes are associated with a combination of medication and behavioural interventions (Corcoran & Dattalo, 2006; Rostain & Tamsay, 2006).

Pharmacological treatment. Stimulants, such as methylphenidate (Ritalin and Concerta) and amphetamines (Adderall) and non-stimulants, such as atomoxetine (Straterra) are approved drugs for the treatment of ADHD (Gualtieri and Johnson, 2008; Sharma & Couture, 2014; Tucha et al., 2011). Stimulants are considered to be efficacious for long-term treatment of ADHD. Both immediate and extended-release forms are available and display equal efficacy in clinical trials (Tucha et al., 2011). The extended-release formulations are

more expensive than the immediate release forms, however, they offer advantages of convenience, confidentiality in the school or work place, as well as greater compliance (Sharma & Couture, 2014). The lifelong use of stimulants has been associated with much controversy, as many people believe the stimulant drugs to increase the risk of physical side effects (e.g., headaches, gastrointestinal problems and decreased appetite with weight loss) and dependence. However, studies have shown that there is a more robust effect when stimulant use is initiated at an earlier age, and it has been noted that there is no evidence to support that treating ADHD with stimulants may lead to drug abuse (Biederman, 2003; Sharma & Couture, 2014). Stimulant treatment has also been shown to decrease the likelihood that an individual with ADHD will develop ODD or a mood or anxiety disorder, and it is also associated with reduced aggression and antisocial behaviour (Sharma & Couture, 2014). Stimulants may not be suitable for some individuals with ADHD due to non-responsiveness or partial responsiveness, intolerance to side effects (e.g. insomnia), or the presence of medical issues such as cardiovascular problems or tic disorders. In addition, some parents may have an aversion to their children using stimulant medication (Gualtieri and Johnson, 2008). Non-stimulants may replace stimulants or may be added as adjuncts to the treatment of ADHD. Non-stimulants may have a less robust effect than stimulants, however, some studies have determined non-inferiority or equal efficacy of these two drug types (Hazel et al., 2011; Shier, Reichenbacher, Ghumar, & Ghumar, 2012).

Since the prevalence of ADHD tends to be high, much research has been focused on the various treatment options available to improve symptoms (Rutledge et al., 2012). In view of the fact that pharmacological treatment with stimulants does not ameliorate all the difficulties with attention that a child with ADHD may experience, non-pharmacological treatments that are designed to improve attention have been investigated as an adjunct to the

use of stimulants (Kerns et al., 1999; Semrud-Clickman et al., 1998; Tamm et al., 2010; 2013; Williams, 1989).

Non-pharmacological treatment. Non-pharmacological interventions that have been developed for children with ADHD have been focused on behavioural management or cognitive-behavioural strategies (Barkley, 1990; Reid & Harris, 1993). Programmes to improve attention in children with ADHD were originally borrowed from cognitive rehabilitation programmes designed for individuals with a brain injury (Sohlberg & Mateer, 1987). More recently, research has been conducted on the development of attention training interventions and strategies for children with ADHD (Semrud-Clikeman et al., 1998; Tamm et al., 2010, 2013; Thomson, Seidenstrang, Kerns, Sohlberg, & Mateer, 1994).

Attention training. Attention training is considered to be a treatment intervention in which various components of attention, i.e. sustained, selective, alternating and divided attention, are viewed as skills which one can enhance by training (Tamm et al., 2013). The rationale behind attention training is based on the concept that repetitive practice of these specific components of attention will increase efficiency as practice produces adaptations in the underlying neuroanatomical networks that are linked to these processes (Kerns et al., 1999; Posner & Petersen, 1990). Since such training focuses on training central attentional skills that one uses in many tasks, an improvement in multiple tasks is expected which is referred to as transfer of training (Tamm et al., 2010).

Studies of attention training in children. The results from published studies provide support for attention training in children with ADHD (Semrud-Clikeman et al., 1998; Tamm et al., 2010, 2013; Williams, 1989). Researchers report improvements on attention skills being trained directly as well as improvements in untrained measures of attention (those domains of attention that were not trained during the intervention) (Semrud-Clikeman et al., 1998; Williams, 1989). In addition, parent and teacher ratings revealed a decrease in ADHD

symptoms following the intervention; however these findings were not always consistent (Kerns et al., 1999; Semrud-Clikeman et al., 1998; Tamm et al., 2010, 2013).

One particular attention training intervention that has shown potential is Pay Attention!, which focuses on sustained, selective, divided and alternating attention (Kerns et al., 1999; Tamm et al., 2010, 2013; Thomson et al., 1994). This intervention is a modified version of the adult program, Attention Process Training (APT). It was developed with younger children in mind; more specifically children aged 4 to 10 years old (Thomson et al., 2005). Pay Attention! was the intervention of choice in the current study based on recent studies that revealed significant results with the use of this intervention with children with ADHD (Kerns et al., 1999; Tamm 2010; 2013).

Studies using the Pay Attention! intervention. In a randomised controlled trial using Pay Attention!, Kerns et al. (1999) reported significant gains in measures of sustained attention in seven children aged 7 to 11 years diagnosed with ADHD who received the intervention compared to children with ADHD in a control group who played video games (Kerns et al., 1999). The treatment and control groups were matched on age, sex and medication status. Both groups completed pre- and post-intervention assessment batteries that included psychometric measures of attention, a measure of academic efficiency, and behavioural ratings completed by parents and teachers. The participants' diagnosis of ADHD was not, however, verified by the researchers. Results from this study indicated that the children who received the direct intervention did significantly better on a number of non-trained measures of attention and academic efficiency. Behavioural ratings of inattention/impulsivity and hyperactivity completed by the parents did not differ significantly following the intervention. Behavioural ratings completed by the teachers following the intervention showed a marginally significant improvement in inattention/impulsivity (Kerns et al., 1999).

In an open trial (a trial in which both the researchers and participants know which treatment is being administered to whom) of Pay Attention! with 23 children aged 8 to14 years diagnosed with ADHD, Tamm et al. (2010) report improvements in both symptoms of ADHD as well as in executive function. There was no control group in this study as the aim of the study was to determine the feasibility of the intervention in a clinical setting, and whether participants were able to engage in a relatively intense intervention period prior to initiating a larger randomised clinical trial (Tamm et al., 2010).

Tamm et al. (2013) conducted a follow-up pilot randomised clinical trial to examine the efficacy of the Pay Attention! intervention. A treatment group of 53 school-aged children 7 to 15 years old, attended sessions of 30 minutes twice a week for 8 consecutive weeks. Fifty-one participants who were randomised to the waitlisted control group were asked not to begin any new treatment during the waiting period (Tamm et al., 2013). The results of this study were consistent with previous studies and revealed that parents and clinicians reported a decrease in ADHD symptoms; children reported that their attention had improved, and neuropsychological testing showed significant improvements in executive function and measures of sustained attention. The data from Tamm et al. (2013) study supports the increasing body of literature regarding the effects of cognitive training on attention and behaviour.

Principles of attention training. The six tenets of the process specific approach to cognitive rehabilitation, i.e. attention training, are outlined by Sohlberg and Mateer (1987), and these tenets guide the administration model for the Pay Attention! intervention.

1. A theoretically motivated model, such as that presented by Sohlberg and Mateer (1987), defines each cognitive process area; namely focused, sustained, selective, alternating and divided attention. Using a theoretical model such as this ensures a scientific basis for the treatment that is being offered.

2. The therapy tasks are administered repetitively. The repetition of tasks is essential to the success of attention training. Repetition increases efficiency, which leads to adaptations in neuroanatomical networks.

3. The five attentional constructs and the tasks within each construct are organised hierarchically allowing the tasks to be administered systematically. When a child masters an initial cognitive task, they progress to a more demanding task within each construct. In this way, the child's attention skills can be repetitively taxed at increasing levels of difficulty.

4. The treatment is databased in order to ensure that a child's attention skills are treated most effectively. The database enables the clinician to determine whether to continue, modify or terminate a particular training activity based on whether progress is being made, progress has plateaued or progress has reached a summit.

5. Generalisation probes, which can consist of standardised measures, questionnaires or real-life behaviour probes, are made systematically to determine treatment efficacy. This component of treatment is integral in order to ensure that progress is being made in the arena in which it is needed.

6. The ultimate measure of success is positive change in everyday functioning. A child may improve on attention training tasks or standardised tests. In order for rehabilitation to be deemed successful, the improvement in attention skills need to generalise to everyday functioning within school, home and/or social environments. This highlights the importance of the clinician who is facilitating the intervention to be aware of the child's everyday attention function and use generalisation probes as discussed.

Internationally, there appears to be a growing body of literature on cognitive rehabilitation and on attention training specifically (Amonn, Frölich, Breuer, Banaschewski, & Doepfner, 2013; Kerns et al., 1999; Semrud-Clikeman et al., 1998; Tamm et al., 2010, 2013; Williams, 1989). Although researchers in South Africa have investigated various

factors such as working memory (Alloway & Cockcroft, 2014; Cockcroft, 2011), the clinical presentation in a multicultural clinical sample (Slone, Durrheim, and Kaminer, 1996), the suitability of behaviour rating scales (Meyer, Eilertsen, Sundet, Tshifularo and Sagvolden 2004), and teachers' knowledge and misperceptions (Perold et al., 2010), for example, in relation to ADHD, there is a dearth of literature pertaining cognitive rehabilitation as a treatment approach for ADHD in this context.

Rationale

This research was undertaken because of a need for such services in South Africa. The results of studies using Pay Attention! suggest that direct interventions aimed at improving attention skills may be a valuable treatment intervention for improving cognitive efficiency in children with ADHD and therefore warrants further investigation. In the South African context, research on attention training generally and with Pay Attention! specifically, is limited. In an unpublished South African study, Schrieff (2013) reported on a pilot case-controlled study using Pay Attention! However this study was with children, aged 7 – 10 who had sustained a severe traumatic brain injury (TBI). The results of this study revealed a reliable change in one of four participants with TBI, specifically in the domain of inhibition (Schrieff, 2013). Pay Attention! has not been used on children with ADHD in South Africa. In addition the study reported on in this thesis included participants in a narrower age range than in previous studies, the sessions and the overall length of the intervention were of a longer duration compared to previous studies (Kerns et al., 1999; Tamm et al., 2010; Tamm et al., 2013).

CHAPTER 3: METHOD

Introduction

The aim of the present study was to investigate the feasibility of the Pay Attention! intervention for South African children aged 6 to 8 years from low to middle socioeconomic status backgrounds who have been diagnosed with ADHD. In this chapter, an overview of the research design employed to achieve this aim will be provided. This overview is followed by a detailed description of the sample, inclusion and exclusion criteria, participant recruitment process, the measures employed for pre- and post-assessments, as well as the data collection, and data analysis methods employed. In addition to this, relevant ethical considerations for the research process are presented.

Research design

This study involved a quasi-experimental pre-test post-test two-group comparison. Participants who were identified as suitable for the study were assigned to one of two groups: an Intervention group and a wait-listed, Test-only control group. Only the participants in the intervention group received the Pay Attention! intervention during the course of the study. The wait-listed Test-only group would only receive the intervention at the end of the study, should feasibility and efficacy for the programme be demonstrated for the intervention group during the course of the study. The purpose of the Test-only group was to control for maturation and test-retest effects (Rohling, Faust, Beverly, & Demakis, 2009).

The two groups were tested on two occasions: before and after the intervention on a battery of attentional measures. Pre-testing and post-testing sessions were approximately 3 months apart and took place at the University of Cape Town (UCT). The intervention took place at either UCT or at the child's school.

Sample

A total of 10 participants were recruited for the study, to be divided into two groups of five. The participants were 6 to 8 years of age with a diagnosis of ADHD, according to the DSM-5, as diagnosed by a treating professional (e.g. psychologist, paediatrician).

This sample size for the pilot study was based on the recommendation that the sample size be 10% of the typical size of a fully powered clinical trial comparing an intervention with a control group (Hertzog, 2008). Using G power, a medium effect size (0.3) and α 0.05, 111 participants would be required to power the larger trial; hence the 10 participants for this pilot study. In addition, it was necessary to consider the intensive one-on-one nature of the intervention and constraints in terms of time and resources. The Pay Attention! intervention was administered approximately 10 hours per week (5 participants x 2 sessions x 45 minutes per session) for 12 weeks. In addition, pre- and post- testing accounted for 60 hours (10 participants x 2 sessions x 3 hours), the parents' assessment for 40 hours (10 participants x 2 sessions x 2 hours), and teachers' assessment for 20 hours (10 participants x 2 sessions x 1 hour), for a sample of this size. Depending on the outcome and logistics of this preliminary study, the research can be expanded to include more children for a larger study at a later stage.

Inclusion criteria. Children eligible for the current study 1) were English-speaking, 2) were 6 to 8 years of age at the start of the intervention, 3) had a performance of at least 1 SD below the appropriate age norm on 20% of the attention pre-tests, 4) had parents who had provided informed consent for their participation, and 5) had provided assent for their participation. These inclusion criteria were put in place 1) so that a uniform neuropsychological test battery could be utilised across the sample, and because the intervention materials are only available in English, 2) because the Pay Attention! intervention was designed for children aged 4 to 11 years, and a number of the tests in the

assessment battery were designed for children from 6 years of age, and 3) based on previous international studies on attention training in children with ADHD (Kerns et al., 1999; Tamm et al., 2010, 2013). Inclusion criteria (4) and (5) were mandatory for ethical reasons. Participants who were taking medication were not excluded. However, participants were asked not to initiate new medication during the course of the study as far as possible (Tamm et al., 2010, 2013; Tucha et al., 2011). Since psychiatric co-morbidities, such as anxiety disorders or depressive disorders are common in children with ADHD, I did not exclude a child with a co-morbid psychiatric condition (Tamm et al., 2010; Tucha et al., 2011).

Exclusion criteria. Children were not eligible to participate if: 1) they had a history of traumatic brain injury (TBI) or other congenital or acquired neurological conditions, 2) they had a diagnosis of premorbid neurological impairment, as these conditions could affect their attention over and above their ADHD diagnosis (Kerns et al., 1999; Tamm et al., 2010), and 3) they were participating in other non-pharmacological treatment interventions for ADHD.

Recruitment

I contacted fifty-two practitioners in private practice, including paediatricians, clinical psychologists and educational psychologists, via email and/or telephonically to inquire about potential participants in their practice. Initially ten of the practitioners whom I had contacted responded to say they were willing to assist in recruitment and may have suitable children in their practice. However, when I followed up to enquire about suitable children I received no response from these practitioners. A further seven responded to say they would be unable to assist in the recruitment process due to the extra workload it would create in terms of perusing client files and confidentiality. The remaining 35 practitioners did not respond to initial or follow-up emails and/or telephone contact.

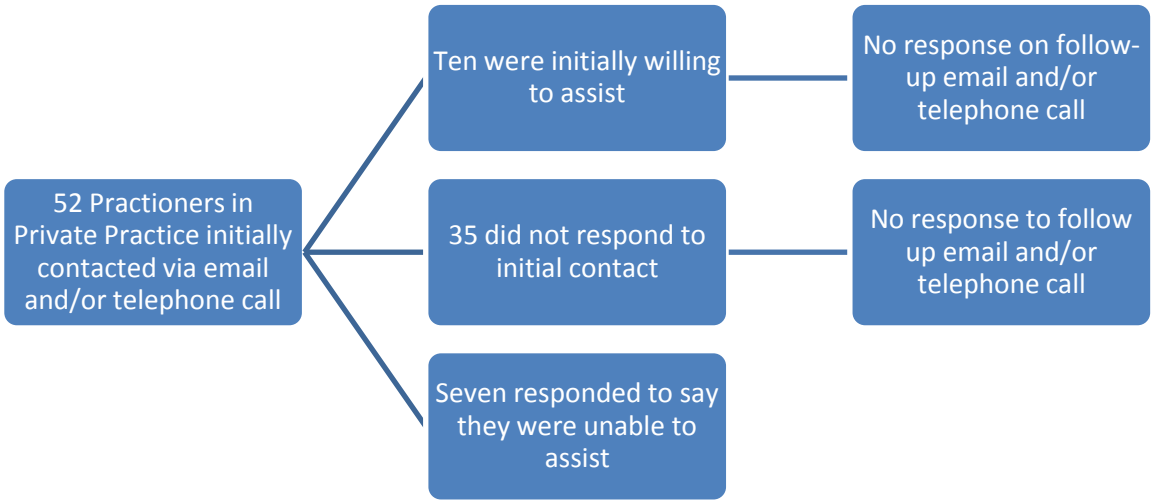

Figure 1. A flow chart representing the process of recruitment via medical practitioners in private practice.

In addition, I contacted 16 schools (11 mainstream and 5 Special Needs Schools) in the Cape Town area to enquire about potential participants. I made telephonic and/or email contact with the school principal, learning support teachers, school counsellors, remedial teachers, occupational therapists and/or school nurses in each of these schools. Of these schools, two schools did not have children who met the age criteria, the children with ADHD in these schools tended to be older than 8 years of age. The principal and remedial teachers at three schools stated that they would be willing to assist with recruitment of participants. This initial telephonic and/or email contact was made just prior to school holidays and an extensive stretch of public holidays. On follow-up, when schools re-opened, there was no response from two of these schools. The third school, a Special Needs School, had three children who met the age criteria. However, one child was found to be ineligible due to a congenital neurological condition.

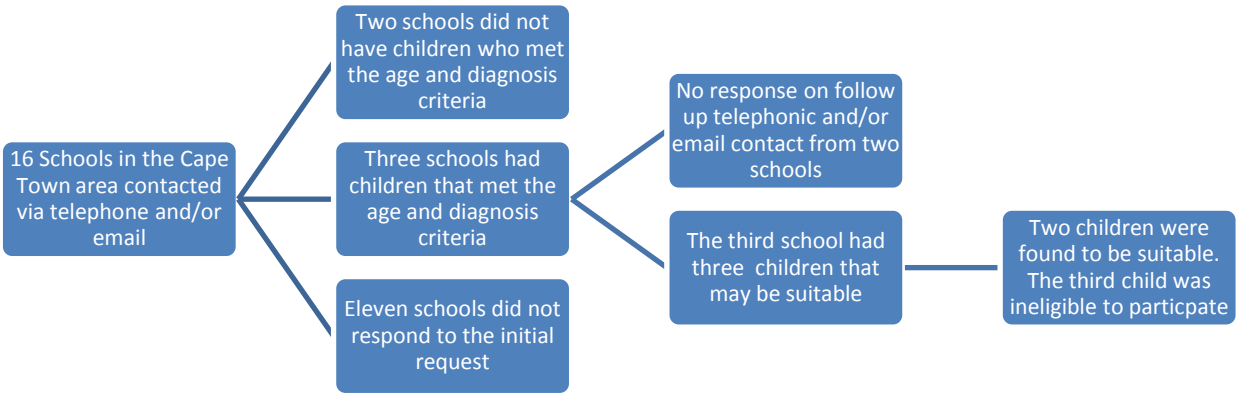

Figure 2. A flow chart representing the recruitment process via schools in the greater Cape Town area.

Clinicians and school personnel were required to use the information they had with regards to their clients or learners, respectively, to make an initial assessment of the child's eligibility, with regards to age and diagnosis, for inclusion in the study. If they had suitable participants, I sent the letter of participation (refer to Appendix B) to the clinician or school, which was forwarded to parents of children who met the criteria for the study. I then contacted the parents of potential participants telephonically and gave a brief verbal description of the study as well as confirmed the inclusion and exclusion criteria.

Advertisements for participants were placed on two websites specifically targeted at parents who have children with ADHD, as well as on the social media pages (i.e. Facebook) linked to these sites. However, I received no response from these advertisements. I also made contact with an ADHD support group that services the greater Cape Town area. The facilitator of this group offered to send information regarding the study to her email data base. Ten parents made initial contact, however, two were not interested when they realised the necessary time commitment for the duration of the intervention. Therefore, eight children were identified and invited to participate in the study. For the identified participants, a

meeting was scheduled at the University of Cape Town, where a more detailed description of the study was offered.

Measures

Demographic Questionnaire. To measure the demographic information and the asset index of the participants I used a demographic questionnaire, which is based on methods put forward by Myer, Stein, Grimsrud, Seedat, and Williams (2008). Demographic information that is captured using this questionnaire includes details regarding parental education, occupation and income (see Appendix C). The questionnaire also includes an asset index in addition to more traditional measures of SES (Myer, Ehrlich, and Susser, 2004). More specifically, these assets include material resources present in the household, for example, running water, a flush toilet, a refrigerator, a television and a domestic worker. The assets also include financial resources such as using financial services (i.e. bank account, ATM card or credit card) and whether they have an account at a retail store. Using this measure, asset ownership is divided into three groups based on the total asset score: 0-5 (low asset ownership), 6-12 (medium asset ownership), and 13-17 (high asset ownership) (Myer et al., 2008).

Neuropsychological measures. The assessment battery discussed below includes a selection of subtests from standardised neuropsychological batteries, developed and normed in the United States, Canada, the United Kingdom and Australia. The selection of tests was guided by published literature on paediatric neuropsychological measures and studies using these measures (Kerns et al., 1999; Semrud-Clikeman et al., 1998; Tamm et al., 2010, 2013).

General intellectual functioning. The Wechsler Abbreviated Scale of Intelligence (WASI) was used as a measure of general intellectual functioning. The WASI can be used with individuals aged 6 to 89 years (Wechsler, 1999). All four WASI subtests (Vocabulary, Similarities, Block design and Matrix Reasoning) were administered to obtain a measure of

participants' Full Scale IQ (FSIQ). The *Vocabulary* and *Similarities* subtests provide a measure of participants' Verbal IQ (VIQ). The *Block Design* and *Matrix Reasoning* subtests provide a measure of participants' Performance IQ (PIQ) (Wechsler, 1999). The WASI was only used at pre-test to establish a baseline, as general intelligence is not expected to improve on completion of the intervention.

VIQ subtests

Vocabulary. This subtest includes 42 items along an increasing gradient of difficulty that assesses the knowledge of words, language development and vocabulary acquisition. Items 1-4 require that participants' name the pictures presented to them. Items 5-42 require that participants provide definitions of words presented orally and visually for certain age groups. Reliability coefficients for this subtest range from .86 to .93.

Similarities. This is a 26-item subtest that assesses verbal concept formation and categorical reasoning. For items 1-4, participants are presented with two rows of pictures. There are three pictures in the top row which are thematically related. There also three pictures in the bottom row, only one of which relates to the pictures in the top row. Participants must then decide which one of the pictures in the bottom row relates most closely to those in the top row. For items 5-26, participants are asked to explain how the two words presented to them are verbally similar. Reliability coefficients for this subtest range from .81 to .91.

PIQ subtests

Block Design. The block design subtest assesses perceptual organization, spatial visualization, visual-motor coordination, and abstract conceptualization. In this 13-item subtest participants are required to reproduce designs made up of red- and white-coloured cubes within a given amount of time. These designs are constructed and/or presented, from

models printed in a stimulus booklet, by the test administrator. Reliability coefficients range from .86 to .93.

Matrix Reasoning. Matrix reasoning is a 35-item subtest that assesses nonverbal fluid reasoning and mental perception of relationships between abstract symbols. Participants are presented with a matrix of patterns consisting of four to nine components. One of the components of the pattern is omitted; participants must select the missing part from a choice of five items presented at the bottom of the page. Reliability coefficients range from .86 to .96.

Psychometric properties. In a paediatric population test-retest reliabilities for the four subtests range from .92 to .95. and from .81 to .97. Inter-correlations between subtests range between .50 and .70. When content validity was examined in relation to the WISC-III, correlations for the VIQ, PIQ and FSIQ were .82, .76 and .87 respectively (Wechsler, 1999). The WASI therefore demonstrates at least moderate construct validity.

Cross-cultural use/use in South Africa. The performance of a group of ethnically diverse individuals from Hispanic, Asian, and Middle-Eastern backgrounds who were fluent in English on the WASI was compared to a group of Anglo-American individuals who spoke only English (Razani, Murcia, Tabares, and Wong, 2007). The Anglo-American group performed better only on the verbal subtests than the ethnically diverse group. Hence, the WASI can be used in ethnically diverse populations, but issues of language and culture need to be considered, especially with the verbal subtests.

The WASI has previously been used in South African research on children and adolescents (Ferrett, Carey, Thomas, Tapert, & Fein, 2010; Hoare et al., 2012).

Tests of attention, executive function and working memory. Various subtests of the Test of Everyday Attention for Children (TEA-Ch; Manly, Robertson, Anderson, & Nimmo-Smith, 1999), the *Inhibition* subtest of the Nepsy-II (Korkman, Kirk, & Kemp,

2007), and the *Numbers subtest* of the Children's Memory Scale (CMS; Cohen, 1997) were used to assess these cognitive processes.

The Test of Everyday Attention for Children (TEA-Ch). This battery consists of nine subtests that measure selective, sustained and divided attention, as well as attentional control in children aged 6 to 16 years through visual, motor and auditory modalities (Manly et al., 2001). The brief screening version of the TEA-Ch (Manly et al., 2001) was used as a measure of attention in this study. The brief screening version consists of four of the nine subtests from each of the attentional domains listed above. These subtests include: *Sky Search, Score!, Creature Counting, and Sky Search Dual Task (DT).*

The *Creature Counting* subtest required that the participant be able to count backwards from 10 to 0. This is a task that children younger than 5-years old and/or with Neurodevelopmental Disorders, such as a Specific Learning Disorder, ADHD or Intellectual Disability struggle with (Manly et al., 2001). While ADHD is not considered a learning disability, research indicates that approximately 30-50 percent of children with ADHD also have a Specific Learning Disability, and the two conditions may interact to make learning extremely challenging (Feldman & Reiff, 2014). Therefore, an additional subtest from the remaining five subtests of the TEA-Ch, the *Same world/Opposite world* subtest was administered to all participants. This subtest also measures attentional control, however, it does not rely on the ability to count backwards from 10 to 0.

Same world/Opposite world. This task requires that participants are able to identify and name the numbers one and two. In the *Same World* component, participants are required to read a random array of the numbers one and two as the examiner points to each number. In the *Opposite World* component, participants complete a similar task; however, this time, one is read as two and two is read as one. Both components are timed. There are two 'same world' and two 'opposite world' components in this subtest. The test-retest reliability

coefficients for the Same World and Opposite World components of this subtest are .87 and .85, respectively.

Sky Search. This subtest assesses selective and focused attention. The subtest is divided into two parts, an attention and a motor control component. In the attention component, participants are required to circle as many pairs of target spaceships, as quickly as possible, that are on a sheet filled with pairs of both target and distracter spaceships. In the control component, once again participants are required to circle as many pairs of target spaceships as quickly as they can on a page that contains only target spaceships and no distracter stimuli. A final attention score is determined by subtracting the score of the motor control component from the score of the attention component. The test-retest reliability coefficients for the time per target and attention score components of this subtest are .80 and .75, respectively.

Score! This subtest measures sustained attention. Participants are required to keep a mental count of the number of scoring sounds heard on a soundtrack, "as if (they) were keeping score by counting the number of scoring sounds in a computer game" (Manly et al., 1999, p. 10). The lengths of the pauses between sounds vary from very short to fairly long intervals making this an appropriate measure of a participant's ability to sustain his/her own attention.

Sky Search Dual Task (DT). This subtest is a measure of sustained and divided attention. Participants are required to complete a task that incorporates the attention component of the Sky Search subtest and the *Score!* task (as described above), simultaneously. The test-retest reliability coefficient for this subtest is .81.

Psychometric properties. The TEA-Ch has test-retest reliabilities ranging from .57 to .87, and has demonstrated good construct and convergent validity (Manly et al., 2001).

Cross-cultural use/use in South Africa and/or with children with ADHD. It has shown good cross-cultural applicability (Chan, Wang, Ye, Leung, & Mok, 2008; Halliday et al., 2012). A Chinese version of the TEA-Ch was evaluated in a sample of 232 healthy children (Chan et al., 2008). Psychometric properties, in terms of construct validity and test-retest reliability, remained acceptable, demonstrating cross-cultural application of the TEA-Ch.

The TEA, the adult version of the TEA-Ch, has only been used in one published study in South Africa (Powell, 2000). The TEA-Ch has, however, been used in unpublished South African work in the field of paediatric neuropsychology (Malgas, 2010; Schoeman, 2011, Schrieff, 2013.). The Tea-Ch has been used in a sample of children with ADHD (Tamm et al., 2013).

NEPSY-II Inhibition subtest. The NEPSY-II (Korkman et al., 2007) is suitable for children aged 3 to 16 years and measures six cognitive domains: memory and learning, executive function and attention, language, visuospatial processing, social perception and sensorimotor functioning. I used the *Inhibition* subtest to measure the participants' capacity to inhibit prepotent responses in favour of responses that the task requires.

This subtest has three conditions: naming, inhibiting, and switching, which are repeated in two trials. In the first trial, black and white shapes (circles and squares) are presented. In the second trial, black and white arrows (up and down) are presented. In the Naming condition, examinees are required to name the stimuli; the types of shapes or the directions of the arrows. In the inhibition condition, participants are required to give the alternate response for the stimulus, meaning that they should say 'circle' when they see a square and vice-versa, and 'up' when they see a down arrow, and vice-versa. In the switching condition, participants are asked to say the correct name of the shape or direction of the arrow when the stimulus is black, but say the alternate response when the shape or

arrow is white (Korkman et al., 2007).

Psychometric properties. Stability coefficients range from .62 to .89 and strong content and construct validity has been demonstrated (Korkman et al., 2007). Studies of content validity showed that the test is able to distinguish between healthy children and those with known neurodevelopmental disorders (including learning disabilities, ADHD, TBI, autistic disorders, and speech and learning impairment).

Cross-cultural use/use in South Africa and/or with children with ADHD. Cross-cultural applicability of the original NEPSY has been demonstrated in Zambian and American children where language, culture and education did not significantly affect test scores (Mulenga, Ahonen, & Aro, 2001). Although these factors should be taken into account in cross-cultural application of Western based assessment instruments, one could assume that the Nepsy-II is suitable for use in the multi-cultural context of South Africa.

Children's Memory Scale (CMS). I used the CMS (Cohen, 1997) to measure learning and memory. This test was designed for children aged 5 to 16 years. The CMS measures learning in a variety of memory dimensions; attention and working memory, verbal and visual memory, short- and long-delay memory, recall and recognition and learning characteristics (Cohen, 1997). I assessed concentration and working memory, and verbal and visual memory using selected subtests of the CMS. The *Numbers* subtest of the CMS was used to measure simple attentional capacity and working memory. The *Dot Locations* subtest was used to assess visual memory, and the *Word List* subtest was used to assess verbal/auditory learning and memory.

Numbers. Numbers Forward is the first component of this subtest and is a measure of simple attentional capacity. Participants are required to repeat a string of random digits in the same sequence as read out loud by the examiner. *Numbers Backward* is the second component of this subtest and is a measure of working memory. Participants are required to

repeat the digits read by the examiner in the reverse order. Reliability coefficients range from .71 to .83 and from .66 to .82 for these subtests, respectively.

Dot Locations. This subtest measures the child's ability to learn and remember the spatial layout of an array of dots. As with the CMS Word List subtest, the *Dot Location* subtest consists of three phases. In the immediate recall component there are three trials. The participant is presented with a picture of an array of blue dots for 5 seconds. Following this presentation, the participant is asked to reproduce the distribution on either a 3x4 or 4x4 grid, depending on his/her age, using blue plastic chips. A distracter array with red dots is then displayed for 5 seconds, and the participant has to reproduce this new distribution using the same grid and the same blue chips. The participant is then asked to once again reproduce the first array of blue dots, without exposure to the original array. The delayed recall component of the task is conducted approximately 25-30 minutes later.

Reliability coefficients for the *Dot Locations* subtest ranges from .61 to .82. However, for the short delay component the reliability coefficients range from .52 to .57 (Cohen, 1997). The reliability coefficients for the core subtests of the battery range from .61 to .93 and from .65 to .93 for the supplemental subtests.

Word List. This subtest is a measure of the participant's ability to learn and recall a list of semantically unrelated words. On the immediate recall component there are four trials. Participants are read a list of words and are then asked immediately to recall as many words as they can remember. On each trial the participant is reminded only of those words that he/she has forgotten, and then asked again to recall as many words as possible, including those said before. The participant is then presented with a distracter list of words and is asked to recall as many words as possible from that list. On the next trial, the participant is once again required to recall as many words as possible from the first list without being read the list of words again. The delayed recall component of the task is conducted approximately

25-30 minutes later. Participants are once again asked to recall as many words from the first list of words as they can remember. Reliability coefficients range from .66 to .89 for the different components of this subtest (Cohen, 1997).

Cross-cultural use/use in South Africa and/or with children with ADHD. The subtests of the CMS are being used in South African research (Ferrett et al., 2010). There is, however, limited published literature specifically regarding the use of this battery with South African samples and children with ADHD.

Behavioural measures. These measures provide information regarding children's adaptive behaviour, daily functioning and internalizing and externalizing behaviour as reported by parents and teachers. I used the Behaviour Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000), the Child Behaviour Checklist (CBCL; Achenbach, 1991), and the Vineland Adaptive Behaviour Scales-II (VABS-II; Sparrow, Cicchetti, & Balla, 2005) to measure these behaviours.

Behaviour Rating Inventory of Executive Function (BRIEF). The BRIEF was developed to assess the everyday behaviour associated with specific domains of executive function in the school and home environments. There are both parent/guardian and teacher versions of this measure, as it relates to social functioning in both the home and the school context for children aged 5 to 18 years (Gioia & Isquith, 2008; Malloy & Grace, 2005). The BRIEF is useful when working with children who have learning disabilities and attention disorders (Gioia et al., 2000).

There are 86 items in the questionnaire. Parents and teachers rate the child's behaviour on a three-point Likert scale (never, sometimes, and often). These 86 items combine to form two indices, with several subscales. The two main indices are the Behavioural Regulation Index (BRI) and the Metacognition Index (MI). The BRI includes the Inhibit, Shift, and Emotional Control subscales and the MI includes the Initiate, Working

Memory, Plan/Organize, Organization of Materials, and Monitor subscales. The BRI and MI can also be combined to form a Global Executive Composite (GEC) score (Gioia et al., 2000). Higher ratings are indicative of greater perceived impairment (Mahone et al., 2002).

Psychometric properties. The internal consistency for this measure ranges from .80 to .98 for parent and teacher forms in normative and clinical samples. Test-retest reliabilities range from .72 to .92 in parent and teacher forms for normative samples and in parent forms for clinical samples.

Cross-cultural use/use in South Africa and/or with children with ADHD. Cross-cultural applicability has been demonstrated comparing Han Chinese children with ADHD (n = 89) to those with ADHD and OCD (n= 53) (Qian, Shuai, Cao, Chan, & Wang, 2010). A multinational collaborative study including South Africa has used the BRIEF as a measure to assess children and adolescents with foetal alcohol spectrum disorders (Mattson, Crocker, & Nguyen, 2011). The BRIEF has shown a strong relationship with interviews and other parent rating measures of behaviours associated with ADHD (Mahone et al., 2002a).

The Child Behaviour Checklist (CBCL). The CBCL is broadband child behaviour rating scale that can be completed by parents, other close relatives, and/or guardians to detect competencies and emotional and behavioural problems in children and adolescents aged 6 to 18 years (Achenbach, 1991). There are both parent/guardian and teacher versions of this measure, as it relates to both home and school environments.

The CBCL measures competence in various functional domains, using different scales or profiles. I used the internalizing and externalizing syndrome groupings. Internalizing scales provide information about depression/withdrawal, anxiety and other somatic behaviours. The externalizing scales determine the presence of, for example, aggressive and rule breaking behaviours (Achenbach, 1991).

Responses are scored on a Likert-type scale. There are three possible responses:

"very often true"; "somewhat or sometimes true"; or "never true". *T*-scores for these scales ranging from 60 to 65 are classified as 'borderline' and *t*-scores above 65 are classified as being in the 'clinical' range.

Psychometric properties. The test-retest reliability of the CBCL is .95 - 1.00, with inter-rater reliability coefficients of .93 - .96 and internal consistency coefficients of .78-.97 (Achenbach & Edelbrock, 1983; Albores-Gallo et al., 2007).

Cross-cultural use/use in South Africa and/or with children with ADHD. Currently there are 85 translations of the CBCL and cross-cultural applicability has been demonstrated (Boyes, Cluver, & Gardner, 2012; Donald, Mathema, Thomas, & Wilmshurst, 2011; Wild, Furtado, & Angalakuditi, 2012). The CBCL has been used in studies with children with ADHD (Biederman, et al., 1993; Hugo, Speranza, Cortese, Wohl, & Purper-Puakil 2012) as well as by a member of our laboratory in previous studies of South African children (Fischer, 2008).

The Vineland Adaptive Behaviour Scales-II (VABS-II). I used the VABS-II to measure adaptive behaviour and daily functioning. It was designed for individuals from birth to the age of 90 years (Sparrow, et al., 2005).

The test consists of the Survey Interview Form, Parent/Caregiver rating form, an Expanded Interview, and a Teacher Rating Form. Four domains, each with two to three subdomains, are assessed across the tests: Communication (receptive, expressive, written), Daily Living Skills (personal, domestic, community), Socialisation (interpersonal relationships, play and leisure time, coping skills) and Motor Skills (gross, fine). An optional Maladaptive Behaviour domain assesses problem behaviours. The Survey Interview Form and the Parent/Caregiver rating form cover the same content, except the former is administered in a semi-structured interview format and the latter as a rating scale. The test authors suggest that the Parent/Caregiver rating form be used instead of the Survey Interview

Form when time constraints are in place. Therefore, only the Parent/Caregiver Rating Form was used in this study.

The Parent/Caregiver Rating Form consists of 433 items. Parents are required to mark a 2 next to an item if their child usually performs the behaviour without assistance, 1 if the child sometimes performs the behaviour without assistance, and 0 if their child never performs the behaviour without help or reminders.

Psychometric properties. Subdomain internal consistencies range from .70 to .95, and subdomain test-retest reliability coefficients are high, with most values above .85. Inter-rater reliabilities are in the mid to low .70s for domains and subdomains for children aged 7-18. Intercorrelations between subdomains are moderate. Subdomain correlations are larger than correlations between domains, thus indicating construct validity.

Cross-cultural use/use in South Africa and/or with children with ADHD. The test has been normed on children with ADHD (Sparrow et al., 2005), and used in cases of children with TBI (Catroppa et al., 2007; Stancin et al., 2002). The Vineland-II has been used in South Africa in a sample of children with HIV-positive mothers (Ebersöhn et al., 2012).

Attention training intervention

Pay Attention!. The Pay Attention! intervention was designed for children aged 5 to 10 years. It is based on Sohlberg and Mateer's (1989) Attention Process Training (APT) materials, designed for adults. Since the Pay Attention! intervention was designed specifically for children, the materials are more colourful and visually interesting and therefore more engaging to young children. Thomson et al. (1994), who designed the intervention, hypothesised that structured and focused tasks of this nature could improve attentional functioning in children. The improvement should not only relate to the completed tasks and tests but to daily tasks and function too (Tamm et al., 2010). The authors therefore argue that the effects of training should be evident in three domains (Thomson et al., 2005):

task training performance, psychometric assessments, and a measure of every day attentional tasks.

Domain 1: Task training performance. Performance in the actual attention-based tasks being administered should improve (Thomson et al., 2005). The researcher therefore keeps a record of the child's performance on the training tasks.

Domain 2: Psychometric assessments. Compared to the pre-intervention assessment, the post-intervention assessment should reveal significant improvements in attention (Thomson et al., 2005).

Domain 3: Measure of everyday attentional tasks. The Pay Attention! authors state that the intervention has not been successful if transfer of function does not occur to the school, home, and/or social environments (Thomson et al., 2005). Therefore, during pre-testing and post-testing assessments, the researcher will ask parents and teachers to identify an everyday behaviour affected by inattention.

The materials for the Pay Attention! intervention include two decks of family cards, three house stimuli with three distracter overlays, four audio compact discs, a response buzzer, two erasable marker pens, an eraser, a stopwatch and a CD-ROM with the necessary forms and score sheets (Thomson et al., 2005). Familiar concepts form the focus of the materials. These familiar concepts include people's features (hair colour, sex, and clothing), family relationships (siblings, parents, grandparents) and household characteristics (the function of rooms in the home). Both visual and auditory stimuli are used.

The four different tasks in the intervention include Card Sort, House Search, Card Flip, and Attention CD. In the first three tasks, Card Sort, House Search and Card Flip, the focus is on training attention in a visual modality. The fourth task is an Attention CD, which focuses on training attention in an auditory modality. The same four tasks are used across

each attentional domain, but the tasks are adapted to suit each domain. To increase the difficulty of each task various parameters or stimuli are used.

Card Sort. For the sustained attention domain, participants are required to use various criteria to sort the cards into piles. The sorting criteria increase in difficulty level with the number and/or complexity of the features and by adding houses in to which to sort. The beginning of the task requires that the participant sort the cards according to a single feature, for example, families (black, blue, or green families) or clothing (hats or no hats), and then progresses to multiple features such as hair colour and glasses (or no glasses). This task requires the participant to sustain his/her attention during a continuous performance task, which is time based, therefore participants are encouraged to sort as quickly as they can.

For the selective attention domain, the same exercises are used as in the sustained attention task, however, the participant is required to selectively attend to the card sort task in the presence of auditory distractions (a compact disk with auditory distracters e.g., the sound of a heartbeat, noise from a school playground or a ringing telephone playing in the background). The tracks are designed to be increasingly distracting, but different tracks may be more distracting than others for some participants.

For the alternating attention domain, the participant is required to sort the cards into two piles and switch upon the trainers instruction between two different sorting criteria (e.g., green family vs. other families and blue family vs. other families). This task is designed to increase mental flexibility as the student switches between criteria.

In the divided attention domain task, the participant is required to sort the cards into piles while performing an additional task at the same time (e.g., sorting the cards into different families and placing the boys face down). The sorting criteria increases in difficulty with the number and/or complexity of the features, and by instructing the participant to sort

both the family card decks, thereby increasing the length of the time the participant is required to divide his/her attention.

House Search. For the sustained attention domain, the participant is required to cross out target stimuli in or around the house using an erasable pen. The cancellation criteria increase in difficulty level with the number and/or complexity of the features. Initially the participant marks a single feature, such as green things or things on the bed, and progresses to marking multiple features, such as animal and books. The task requires the participant to sustain his/her attention during a continuous performance task, which is timed, and therefore participants are encouraged to work as quickly as they can.

For the selective attention domain, the participant performs the same tasks as in the sustained attention domain, while inhibiting responses to the distracting stimuli in the form of distracting visual overlays (transparent sheets with curved intersecting lines, multiple fine dots or small square blocks) which are placed over the house. Once again, the cancellation criteria increase in difficulty with the number and/or complexity of the features.

For the alternating attention domain, participants are instructed to start searching for and crossing out one target stimulus, such as cups and glasses, and then to switch, when instructed by the trainer, to cross out a different target stimulus, such as green things. This task is designed to increase mental flexibility as the participant switches between target features.

For the divided attention domain, the participant responds to the auditory stimuli on the CD while performing a concurrent visual search task (e.g., cross out the red things in the house while listening for words beginning with the letter B).

Card Flip. For the sustained attention domain, the participant is required to respond to target stimuli by pressing a clicker. The response criteria increase in difficulty with the number and/or complexity of the features. The task begins with a single feature, such as a

member from the Black family, and progresses to multiple features, such as brunette colour hair and glasses or someone wearing glasses followed by someone wearing a hat.

For the selective attention domain, the same instructions are followed as in the sustained attention domain, with the addition of auditory distraction (the same CD used in the Card Sort task). Participants respond to target stimuli by pressing a clicker with a track from the auditory CD playing simultaneously.

For the alternating attention domain, participants switch between responding to two stimuli at the trainer's instruction. The Card Flip and Attention CD tasks are combined for the divided attention domain.

Attention CD. For the sustained attention domain, the participant is required to respond to hearing the target stimuli by pressing a clicker (e.g., listening for red, among a number of different colour names). Response criteria increase in difficulty level with the complexity of the stimuli as well as increasing the speed with which the participant is required to respond. This task requires students to sustain their attention during a continuous performance task. The CDs are arranged hierarchically from easier to more difficult, with slow and fast conditions for each task.

For the selective attention domain, the same sustained attention task is used, however additional distracting stimuli are included with each track (e.g., the sound of a heartbeat, people telling a story or a baby crying).

For the alternating attention domain, the participant responds to target stimuli by pressing the clicker. The target stimuli change in response to the trainer's prompt (e.g., red or cow).

For the divided attention domain, the participant sorts cards into piles while pressing the clicker each time a target stimuli is heard on the CD.

Progressing from one task to the next is based on two criteria: number of errors and task completion time. If the participant's number of task errors decrease or their task completion time improves over three consecutive sessions, then the trainer can procede to the next task. The intervention begins with tasks pertaining to sustained attention. Progression to other attentional domains will vary according to the participant. No session includes tasks that require more than two attention components, and participants are not required to complete all tasks in the training manual. Participants progress as far as they can within the allocated time for the intervention (Thomson et al., 2005).

Data collection

Testing. Once recruited, all participants were tested on the neuropsychological battery described. The pre-intervention testing sessions were necessary to establish a baseline for each participant. These tests were administered within 1 to 2 weeks prior to starting the intervention phase and 12 to 14 weeks later (within 1 to 2 weeks of completing the intervention). Pre-testing took approximately 3 hours while post-testing took approximately 2 hours (without the WASI). Regular breaks were offered during testing, and I provided refreshments.

Upon arrival at the testing venue, I explained the study to the parent and addressed any questions. I then asked the parent of the participant to sign a consent form and the participant to sign an assent form (See Appendices D, E and F). Participants were reminded that their involvement in the study was voluntary and that they could withdraw at any stage for any reason and without penalty. These assessments took place in quiet rooms at The University of Cape Town's Psychology Department or the Child Guidance Clinic (CGC), also at UCT. While the children were being tested I conducted a history taking session with the parent and they were asked to report on the functional outcomes of their children using measures previously described (Refer to Appendices G for the History Questionnaire). I

liaised with the teachers at the schools to ensure that the teachers' measures were completed at pre- and post-test (refer to Appendices H & I for the letter to teacher and the teacher consent form). Tamm et al. (2010) reported that asking parents to give teachers the rating scales to complete led to poor compliance. I visited three teachers at the schools to administer the pre- and post assessments. I contacted three teachers telephonically to discuss the study and the pre-assessment forms, which were given to them by the parent. The remaining four teachers I also contacted telephonically but the forms were delivered by fax or email. All pre-assessment forms were received prior to commencement of the intervention. I gave the post-assessment forms to the teacher of the participant on completion of the intervention and these were collected at the post-assessment session with the participant and parent.

Two clinical neuropsychology Masters students, trained in these measures, assisted in carrying out the pre- and post-tests. During post-testing, the testers were blind to the participants' group. Children were not tested by the same examiner at pre- and post-testing sessions. I facilitated all of the interventions, and therefore was not involved in the pre- or post-testing of participants to prevent experimenter bias (Wilson & MacLean, 2011). I also facilitated the history taking and parent and teacher assessments.

The intervention group formed part of a larger study and was recruited first. The control group was recruited to match the intervention group on age, gender and medication status (Kerns et al., 1999).

Intervention phase

The ADHD Intervention Group. In contrast to previous international studies (Kerns et al., 1999; Tamm et al., 2010; 2013) that implemented the Pay Attention! intervention for 30 minutes twice a week over a period of 8 weeks, in this study I implemented the intervention for 45 minutes, twice a week for a period of 12 weeks. The suggested minimum

period to attain positive student outcome in attention training interventions is 10 weeks (Chenault, Thomson, Abbott, & Berninger, 2006). Schrieff (2013) implemented Pay Attention! for 45-minutes, twice a week, for a period of 10 weeks with children who had sustained TBIs. Her results suggested that increasing the length of the intervention may show stronger end results.

Parents were asked to bring their children to the CGC at UCT twice a week for the duration of the intervention. However, two participants were unable to do so and as a result I carried out the intervention at the children's school to maintain sample size. Tamm et al. (2010) used this model and found no difference in performance between children who completed training at school or in a clinical setting.

My research supervisor, who has obtained her doctorate with research on the Pay Attention! intervention, trained me in administering the intervention. If participants improved their completion time on a task or decreased their number of errors, while maintaining the same level of accuracy for three consecutive trials, the following session then included more difficult task criteria. The intervention commenced with tasks in the first attentional domain, sustained attention.

Waitlisted control group. The children in the Test-only group were tested on the neuropsychological battery at the same time as the Pay Attention! intervention group, before and after the intervention this group received. The children in the Test-only group received no intervention or contact between the two test dates.

Data analysis

I used SPSS 20.0 to analyse all neuropsychological test data.

Demographic data. The first step in the data analysis was to compare the demographic data between the two groups. I used ANOVAs or Mann-Whitney tests to test for between group differences for continuous variables, depending on whether assumptions of

normality and homogeneity were upheld or not. I used the Shapiro-Wilk test for normality and the Levene's test of homogeneity (Field, 2009; Stangor, 2011). Categorical variables were examined using Chi-square or Fisher's exact test (Field, 2009; Stangor, 2011). I used the Fisher's exact test in instances where the sample was small and where the cells of the variables in the analyses had expected counts of less than 5.

Deriving and comparing composite scores. I used a hybrid method to derive and compare composites due to the large number of dependent variables (approximately 17) in comparison to the small sample size (Field, 2009). This method reduced the number of dependent variables to four. Once the test battery had been sorted into composite domains, based on theoretical assumptions and established categorizations, I calculated the Cronbach alpha coefficients. This ensured that the tasks considered to be similar, and thus grouped in each domain, were indeed correlated. I then converted each individual neuropsychological test variable to z-scores, based on n=10. These z-scores were averaged to yield a final composite z-score for each domain (Field, 2009).

Pre- and post-test between- and within-group comparisons. I compared the pre- and post-intervention composite scores of the Pay Attention! intervention group and the Test-only control group, as well the pre- and post intervention parent and teacher behavioural measures. I used the Mann-Whitney U test for the between group comparisons and the Wilcoxon signed-rank test was used for within group comparisons in cases where parametric assumptions had not been met (Field, 2009). I used one-way ANOVAs to compute between-group comparisons where assumptions of normality and homogeneity were upheld, and nonparametric equivalents where assumptions were violated (Field, 2009).

Effect size. I used the r-statistic as a measure of effect size. The r-statistic is commonly used as a measure of effect size. Values of 0.1 can be considered a 'small' effect size, 0.3 represents a 'medium' effect size and 0.5 a 'large' effect size (Salkind, 2008). The

use of *r*-statistic allowed for the calculation of effect sizes for non-parametric statistical analyses.

Within- group comparisons: Individual change. I used the Reliable Change Index (RCI) to determine if changes in individual participants' scores from pre-test to post-test were clinically significant (Jacobson & Traux, 1991). In a research context such as this, it was important to assess whether the change in performance from one assessment session to the next was meaningful or not (Parsons, Notebaert, Shields, & Guskiewicz, 2009). I used the reliable change generator, developed by Devilly (2004) to calculate the individual RCI scores. To determine the RCI scores the data input into the programme were pre- and post-test scores, the subtest's test-retest reliability coefficient (obtained from the relevant test manuals), and the standard deviation of the normative sample for that subtest. The reliable change generator generates the degree of change at three different confidence intervals: 68.26%, 95%, and 99%. I then compared these scores among the participants within each age group.

Case studies. I report on illustrative case studies of the five Pay Attention! intervention group participants. These case studies provide an opportunity to explore in greater depth the impact of both the individual and contextual factors on the intervention outcomes.

Ethical considerations and procedures

This study was approved by the Department of Psychology Ethics Committee at the University of Cape Town as well as the Faculty of Health Sciences Research Ethics Committee (Ref 234/2014) (Appendix J). Permission was obtained from the Western Cape Education Department to include the school learners and to use the school facilities for two participants in the Intervention group (See Appendix L).

Informed consent, assent and voluntary participation. Each participant's parents provided direct informed written consent before the child or themselves took part in the various tests and interventions (du Plooy, 2009) (see Appendix D). Each child signed a letter of assent before testing commenced (see Appendices E & F). No participant was forced, deceived, threatened or subjected to any form of coercion (du Plooy, 2009). Consent was voluntary.

Demands, risks and benefits. Before taking part in the study, each participant's parents were informed about the details of the study, including any possible risks or demands and procedures of the study. The demands included a pre- and post-test battery of assessments of up to 3 hours per session and participation in 24, 45-minute intervention sessions i.e. twice a week for 12 weeks. Specifically, a parent and teacher of each child was asked to complete a pre- and post intervention questionnaire which took up to two hours for the parents and one hour for the teachers.

There were no physical, social or emotional risks to participants. However, it was possible the participants may have experienced fatigue during pre- and post-testing or during the implementation of the intervention. Participants were therefore offered regular breaks during assessments.

There were no direct benefits to participating in the study. However, parents may have benefitted indirectly by gaining an increased understanding of their child's functioning and diagnosis. Each participant was compensated ZAR50 for each session they attended for a total of up to ZAR1300. Participants were awarded with a certificate on completion of the Pay Attention! intervention and given a small toy.

Confidentiality and deception. Pseudonyms are used to refer to each participant in the report to ensure that each participant's right to privacy is protected (du Plooy, 2009). In order to maintain confidentiality, no specific response or behaviour is listed that can be

connected to a particular participant's identity (du Plooy, 2009). Only the researcher and research supervisor have access to the data. Data is stored in a locked cupboard and on a password-protected computer. Participants were not misled or deceived in anyway (du Plooy, 2009).

Control group. This research meets all four criteria considered to be acceptable for a control group that receives no intervention. These criteria include: a) if the efficacy of the treatment is unknown, b) if the treatment is undergoing validation, c) if sufficient resources are unavailable, and d) if the treatment is made available to the control group once it has been shown to be efficacious (Kazdin, 1992). Pay Attention! has only limited evidence to support its efficacy in the treatment of ADHD. Further, there were limited resources in terms of both time and funding in this study. Should the Pay Attention! intervention prove efficacious it will be offered to the Test-only control group.

Debriefing and feedback. I debriefed parents and children during the post-assessment session. They were allowed to ask questions. The results were made available to participants' parents upon request.

CHAPTER 4: RESULTS

Introduction

This chapter is a presentation of the results of this study. The results will be presented in three sections: 1) Socio demographic characteristics of the participants, 2) Between and within group change analyses, and 3) Case studies.

Socio demographic characteristics of the participants

All participants were aged 6 to 8 years (M=7.26, SD=1.03). Two participants were female and eight were male. All participants were aged 3 to 6 years of age at the time of diagnosis, i.e., within the last four years (M=4.8; SD=1.0). All participants were on medication, either Concerta or Ritalin for ADHD, at varied doses. Two participants were taking medication for co-morbid diagnoses.

The Pay Attention! intervention group and the Test-only control group were matched on sex, language, asset index and race with four males and one female in each group. Regarding the demographic characteristics and IQ of the participants, there were no significant between group differences (see Tables 1 & 2).

Table 1
Demographic Characteristics of the Sample (N=10)

Variable	Pay Attention! intervention group (*n*=5)	Test-only control group (*n*=5)	Test statistics	
			F/χ^2	*p*
Age at assessment[a] (*M:SD*)	87.60 (15.08)	98.60 (7.64)	2.12 [b]	.184
Sex (Male:female)	4:1	4:1	<0.01	.778
Language (English: Bilingual)	3:2	4:1	0.48	.500
Asset index (Low:Medium:High)	0:0:5	0:1:4	1.11	.500
Race (white:coloured)	3:2	3:2	<0.01	.738
Medication status[c] (yes:no)	5:0	5:0		

Note . [a]Age at assessment in months. [b]ANOVA *F*-statistic [c]Ritalin or Concerta at varied dosage

Table 2
General Intellectual Functioning Characteristics of the Sample (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
Variable	*M (SD)*	Range	*M (SD)*	Range	*F*	*p*	*r*
Verbal IQ	98.60 (13.90)	84-121	96.20 (22.57)	73-131	0.04	.845	.06
Performance IQ	102.60 (16.94)	79-121	100.80 (21.89)	77-131	0.02	.888	.05
Full Scale IQ	100.60 (12.86)	79-111	98.00 (24.08)	76-135	0.05	.837	.07

Note . The *r* value presented here is an estimate of effect size.

Attendance and attrition

All 5 participants who began the Pay Attention! intervention completed the study and participated in the outcome evaluations. However, the number of sessions attended ranged from 12 to 20 of the 24 sessions. Of the 5 intervention group participants, 3 participants attended at least 80% (20) of the 24 sessions. One participant attended 50% (12) of the sessions and another attended 58% (14) of the sessions. The difference in attendance was

noted between participants who were brought to the CGC by a caregiver for sessions (n = 3) and those who were seen at their school (n = 2). There was a higher attendance rate for those participants who were brought to the CGC compared to those who were seen at their school due to the mid-year school vacation period and school absenteeism. In terms of the modules administered, none of the participants advanced to the divided attention module, 3 participants advanced to the alternating attention module and 2 participants advanced to the selective attention module.

Of the 5 participants who formed the Test-only control group, all completed the study and all participated in the outcome evaluations. All parents and teachers completed the behavioural evaluations at pre- and post-intervention assessment.

Pre- and Post-intervention Between-group Comparison

Cognitive measures. At pre-intervention, there were no significant between-group differences on the Neuropsychological composites and other outcome variables (see Table 3). There were overall varying effect sizes. Effect sizes for the verbal memory composite and working memory were small. Effect sizes for the remaining composites and other outcome variables were medium.

For the between-group differences for the subtest making up these composites, see Appendix N.

Table 3
Between-group Analyses for pre-intervention Neuropsychological composites and variables: Pay Attention! intervention vs. Test-only control group (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
Variable	M (*SD*)	Range	M (*SD*)	Range	*F/U*	*p*	*r*
Basic attention composite[a] (α = 0.711)	-0.30 (0.66)	-1.26-0.25	0.30 (0.87)	-.90-1.35	1.55	.249	.36
Selective attention composite[a] (α = 0.979)	0.31 (1.05)	-1.08-1.39	-0.31 (0.94)	-1.08-0.78	8.50[b]	.421	.30
Divided attention	2.40 (3.13)	1-8	4.20 (4.44)	1-10	9.50[b]	.548	.23
Verbal memory composite[a] (α = 0.853)	-0.03 (0.87)	-1.06-1.17	0.03 (1.01)	-1.70-0.91	0.01	.913	.03
Visual memory composite[a] (α = 0.704)	0.26 (1.01)	-1.44-1.23	-0.26 (0.48)	-0.78-0.18	1.03	.340	.31
Working memory	8.80 (2.59)	6-13	9.60 (4.10)	3-13	0.14	.722	.12
Inhibition	8.00 (4.00)	2-13	9.40 (3.36)	6-13	0.36	.566	.19

Note. [a]Values presented are *z*-scores (for M, SD, range). The *r* value presented here is an estimate of effect size. [b]Mann-Whitney *U;* for Selective Attention, mean rank of the Pay Attention! intervention group = 6.30, and of the Test-only control group = 4.70; for Divided Attention, mean rank of the Pay Attention! intervention group = 4.90, and of the Test-only control group = 6.10.

At post-intervention, there were no significant between-group differences on the neuropsychological composites and variables (see Table 4). There were small to medium effect sizes associated with all these comparisons.

Table 4
Between-group Analyses for post-intervention Neuropsychological composites and variables: Pay Attention! intervention vs. Test-only control group (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
Variable	M (*SD*)	Range	M (*SD*)	Range	*F/U*	*p*	*r*
Basic attention[a] (α = 0.850)	-0.14 (0.80)	-1.46-0.52	0.14 (1.04)	-1.38-1.34	0.21	.656	.15
Selective attention[a] (α = 0.981)	0.01 (0.93)	-1.05-1.44	-0.01 (1.16)	-1.17-1.55	0.00	.974	.01
Divided attention	2.00 (2.24)	1-6	4.60 (5.13)	1-12	9.00[b]	.548	.31
Verbal memory[a] (α = 0.919)	0.09 (0.83)	-1.18-0.96	-0.09 (1.13)	-1.98-1.07	0.08	.791	.09
Visual memory[a] (α = 0.807)	-0.07 (0.86)	-1.27-0.74	0.07 (0.94)	-0.90-1.28	0.05	.822	.07
Working memory	10.40 (4.45)	5-16	10.60 (3.13)	6-14	0.01	.937	.03
Inhibition	10.20 (3.90)	5-15	7.80 (0.45)	7-8	1.87	.209	.40

Note. [a]Values presented are *z*-scores (for M, SD, range). The *r* value presented here is an estimate of effect size. [b]Mann-Whitney *U;* for Divided Attention, mean rank of the Pay Attention! intervention group = 4.80, and of the Test-only control group = 6.20.

Behavioural measures. There were no significant between-group differences for the pre-intervention behavioural measures, the BRIEF parent and teacher reports, the CBCL parent and teacher reports and the VABS-II parent report (see Tables 5 to 9). Overall, the effect sizes varied across the measures. Effect sizes for the parent and teacher rated BRIEF and parent rated VABS-II were small to medium. Effect sizes for the parent and teacher rated CBCL were small to large.

Table 5
Between-group Comparisons: Pre-intervention BRIEF indices (Parent Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
BRIEF index	*M (SD)*	Range	*M (SD)*	Range	*F*	*p*	*r*
Inhibit	63.80 (10.62)	53-78	71.40 (11.91)	57-82	1.14	.318	.32
Shift	69.40 (5.55)	64-77	64.40 (15.76)	47-84	0.45	.522	.21
Emotional control	65.20 (4.87)	58-71	60.00 (9.25)	51-75	1.24	.298	.33
BRI	68.00 (6.63)	61-78	67.60 (9.63)	57-83	0.01	.941	.02
Initiate	62.20 (9.37)	51-75	64.20 (12.11)	50-83	0.09	.778	.09
Working memory	63.00 (9.14)	53-73	69.80 (10.06)	58-80	1.25	.296	.33
Plan/organise	58.00 (13.26)	44-78	69.20 (11.08)	58-82	2.10	.186	.42
Org. of materials	58.80 (7.79)	52-72	61.60 (8.44)	49-71	0.30	.601	.17
Monitor	60.40 (11.42)	50-76	60.40 (7.89)	53-72	0.00	1.00	.00
MI	62.00 (10.17)	52-77	68.80 (10.43)	56-80	1.10	.327	.31
GEC	65.40 (8.08)	58-79	70.60 (8.79)	61-83	0.95	.359	.30

Note. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite; Org = Organisation. The *r* value presented here is an estimate of effect size.

Table 6

Between-group Comparisons: Pre-intervention BRIEF indices (Teacher Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
BRIEF index	*M (SD)*	Range	*M (SD)*	Range	*F*	*p*	*r*
Inhibit	61.00 (15.13)	44-78	63.00 (8.19)	52-74	0.07	.801	.08
Shift	69.60 (22.84)	43-105	55.80 (15.40)	42-77	1.26	.295	.33
Emotional control	71.00 (16.92)	54-99	55.40 (16.29)	43-81	2.21	.176	.43
BRI	70.60 (16.90)	54-98	59.80 (13.62)	46-77	1.24	.298	.33
Initiate	63.20 (9.34)	51-75	59.60 (12.14)	44-75	0.28	.613	.16
Working memory	69.40 (7.40)	61-81	68.20 (11.17)	49-78	0.04	.846	.06
Plan/organise	67.60 (10.29)	58-85	63.60 (18.42)	38-83	0.18	.683	.13
Org. of materials	60.60 (12.30)	47-80	62.80 (13.94)	47-83	0.07	.798	.08
Monitor	60.80 (13.35)	49-83	65.80 (10.26)	52-76	0.44	.525	.21
MI	66.20 (10.23)	59-84	65.80 (13.57)	46-82	0.00	.959	.02
GEC	69.60 (13.24)	58-92	64.40 (14.22)	46-82	0.36	.566	.19

Note. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite; Org = Organisation. The *r* value presented here is an estimate of effect size.

Table 7
Between-group Comparisons: Pre-intervention CBCL Syndrome Profiles (Parent Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
CBCL syndrome profile	*M (SD)*	Range	*M (SD)*	Range	*F/U*	*p*	*r*
Anxious/depressed	63.40 (6.60)	54-70	56.40 (5.23)	51-62	3.82	.086	.51
Withdrawn/depressed	58.40 (8.99)	50-70	55.20 (6.87)	50-66	0.40	.545	.20
Somatic complaints	54.00 (5.79)	50-64	60.00 (8.46)	50-70	7.00 [a]	.310	.38
Internalising problems	61.20 (7.53)	50-68	57.40 (8.20)	45-68	0.07	.802	.23
Rule-breaking behaviour	55.40 (5.41)	50-64	61.20 (6.30)	53-70	2.44	.157	.44
Aggressive behaviour	66.60 (9.48)	52-78	62.60 (7.20)	50-68	7.00 [a]	.310	.23
Externalising problems	63.40 (9.02)	49-73	62.00 (8.00)	48-68	10.50 [a]	.690	.08
Attention problems	66.80 (3.96)	61-71	67.80 (10.06)	57-83	0.04	.841	.07
ADHD problems	69.00 (4.64)	62-75	71.80 (9.18)	62-80	0.37	.559	.19
ODD problems	64.40 (6.58)	55-73	59.60 (6.03)	52-67	1.45	.263	.36

Note. For each comparison presented here, degrees of freedom = (1, 8). The *r* value presented here is an estimate of effect size. [a]Mann-Whitney *U;* for Somatic Complaints, mean rank of the Pay Attention! intervention group = 4.40, and of the Test-only control group = 6.60, for Aggressive Behaviour, mean rank of the Pay Attention! intervention group = 6.60, and of the Test-only control group = 4.40, and for Externalising Problems mean rank of the Pay Attention! intervention group = 5.90, and of the Test-only control group = 5.10.

Table 8
Between-group Comparisons: Pre-intervention CBCL Syndrome Profiles (Teacher Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
CBCL syndrome profile	*M (SD)*	Range	*M (SD)*	Range	*F/U*	*p*	*r*
Anxious/depressed	64.20 (7.85)	53-73	61.00 (14.37)	51-86	7.00[a]	.310	.14
Withdrawn/depressed	56.80 (5.54)	50-64	54.00 (7.38)	50-67	8.00[a]	.421	.21
Somatic complaints	52.40 (5.37)	50-62	61.20 (9.36)	50-75	5.00[a]	.151	.50
Internalising problems	60.80 (7.53)	52-70	59.20 (15.34)	45-85	0.04	.839	.07
Rule-breaking behaviour	54.20 (7.82)	50-68	54.20 (4.55)	50-59	10.50[a]	.690	.00
Aggressive behaviour	62.20 (6.53)	53-69	57.80 (5.40)	50-64	1.35	.279	.34
Externalising problems	61.20 (6.65)	53-69	55.00 (8.63)	41-63	1.62	.239	.37
Attention problems	62.40 (7.77)	54-75	65.40 (8.38)	53-76	0.35	.573	.18
ADHD problems	66.20 (12.28)	55-87	68.00 (9.82)	56-83	0.07	.804	.08
ODD problems	61.20 (8.07)	50-70	55.60 (8.29)	50-70	7.50[a]	.310	.32

Note. For each comparison presented here, degrees of freedom = (1, 8). The *r* value presented here is an estimate of effect size. [a]Mann-Whitney *U;* for Anxious/Depressed, mean rank of the Pay Attention! intervention group = 6.60, and of the Test-only control group = 4.40, for Withdrawn/Depressed, mean rank of the Pay Attention! intervention group = 6.40, and of the Test-only control group = 4.60, Somatic Complaints, mean rank of the Pay Attention! intervention group = 4.00, and of the Test-only control group = 7.00, for Rule-breaking Behaviour, mean rank of the Pay Attention! intervention group = 5.10, and of the Test-only control group = 5.90, and for ODD Problems mean rank of the Pay Attention! intervention group = 6.50, and of the Test-only control group = 4.50.

Table 9
Between-group Comparisons: Pre-intervention VABS-II (Parent Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
Domain Subdomain	*M (SD)*	Range	*M (SD)*	Range	*F/U*	*p*	*r*
Communication	42.00 (9.03)	31-55	35.20 (7.05)	27-46	1.76	.221	.39
Receptive	12.40 (1.14)	11-14	10.60 (2.07)	8-13	2.89	.127	.47
Expressive	16.20 (4.82)	10-23	12.80 (2.59)	9-16	1.93	.202	.40
Written	13.60 (4.22)	9-20	11.80 (4.15)	6-17	0.46	.515	.21
Daily Living Skills	43.60 (15.45)	30-70	48.20 (7.19)	36-55	0.36	.563	.19
Personal	15.00 (4.95)	10-23	18.00 (4.36)	11-22	1.03	.339	.31
Domestic	15.40 (4.34)	12-23	15.20 (1.64)	13-17	9.50[a]	.548	.03
Community	15.20 (5.26)	11-24	15.00 (2.12)	12-17	0.01	.939	.02
Socialisation	45.40 (8.08)	37-58	40.40 (6.19)	33-50	1.21	.304	.33
Interpersonal relationships	15.40 (2.30)	13-19	14.00 (4.12)	11-21	0.44	.526	.21
Play and leisure time	14.00 (4.36)	10-21	12.00 (2.12)	9-14	0.85	.383	.28
Coping skills	16.00 (1.58)	14-18	14.40 (1.34)	13-16	2.98	.123	.48
Adaptive behaviour composite	84.40 (15.24)	63-98	91.40 (9.89)	74-98	11.00[a]	.841	.26

Note. For each comparison presented here, degrees of freedom = (1, 8). The *d* value presented here is an estimate of effect size. [a]Whitney-Mann *U;* for Domestic, mean rank of the Pay Attention! intervention group = 4.90, and of the Test-only control group = 6.10, and for Adaptive Behaviour Composite mean rank of the Pay Attention! intervention group = 5.20, and of the Test-only control group = 5.80.

There were no significant post-intervention assessment between-group differences observed on the parent and teacher rated BRIEF and CBCL (see Appendix M). Post-hoc analyses showed that the Intervention group differed significantly from the Test-only control group on the Expressive subdomain of the VABS-II, $F = 8.74$, $p = .018$, $r = .68$, with a large effect size. There was also significant between-group differences for Interpersonal

subdomain of the post-intervention VABS-II parent report with the Intervention group, $F = 11.59$, $p = .009$, $r = .73$, with a large effect size. In addition, the Intervention group also differed significantly from the Test-only control group on the Socialisation domain of the post-intervention VABS-II parent report $U = 3.00$, $p = .048$, $r = .66$, with a large effect size (see Table 10).

Table 10
Between-group Comparisons: Post-intervention VABS-II (Parent Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
Domain	*M (SD)*	Range	*M (SD)*	Range	*F/U*	*p*	*r*
Communication	42.80 (9.63)	32-54	33.00 (2.35)	31-37	4.55	.065	.57
Receptive	11.60 (2.70)	9-16	9.20 (1.48)	7-11	3.03	.120	.48
Expressive	17.80 (4.54)	13-23	11.60 (1.14)	10-13	8.74	.018*	.68
Written	13.40 (3.05)	10-17	12.20 (1.30)	11-14	.66	.442	.25
Daily Living Skills	50.40 (10.03)	35-63	42.80 (10.13)	31-59	1.35	.279	.35
Personal	24.20 (17.01)	11-54	13.60 (4.77)	10-22	7.00[a]	.310	.39
Domestic	15.60 (2.51)	12-19	13.80 (2.17)	10-15	1.47	.260	.35
Community	16.60 (3.44)	12-20	15.40 (4.56)	11-23	.22	.651	.15
Socialisation	47.60 (3.13)	45-51	38.00 (6.96)	29-47	3.00[a]	.048*	.66
Interpersonal relationships	17.20 (1.79)	15-19	13.20 (1.92)	11-16	11.59	.009*	.73
Play and leisure time	14.00 (2.00)	12-17	10.60 (2.70)	8-15	5.12	.054	.58
Coping skills	16.40 (1.95)	14-19	14.20 (3.03)	10-18	1.86	.210	.40
Adaptive behaviour composite	91.40 (19.23)	62-113	80.80 (18.10)	51-98	.81	.396	.27

Note. For each comparison presented here, degrees of freedom = (1, 8). The *d* value presented here is an estimate of effect size. [a]Mann-Whitney *U;* for Personal, mean rank of the Pay Attention! intervention group = 6.60, and of the Test-only control group = 4.40, and for Socialisation mean rank of the Pay Attention! intervention group = 7.40, and of the Test-only control group = 3.60.
* $p < 0.05$

Pre- and post-intervention within-group analyses

Cognitive measures. There were no significant within-group differences in performance from pre- to post intervention for the cognitive measures (see Appendix O).

Behavioural measures. There were no within group differences in performance from pre- to post intervention for the BRIEF parents and teacher reports and the CBCL teacher report (see Appendix P). There were, however, significant within group differences in performance from pre- to post intervention for the Pay Attention! intervention group CBCL parent report on the Attention Problems Index, with $t = 4.50$, $p = .011$ and ADHD Problems Index, with $t = 4.68$, $p = .009$ with parents of the Pay Attention! intervention group reporting less attention and ADHD problems (see Table 11). In addition, there were significant within group differences in performance from pre- to post intervention for the Pay Attention! intervention group VABS-II parent report on the Personal subdomain with $W = -2.02$, $p = .043$ with parents reporting less problems with personal skills such as eating, dressing and practicing personal hygiene (see Table 12).

Table 11

Parent's behavioural assessment (CBCL): Within-group Comparisons for Pay Attention! intervention and Test-only control group from pre- to post-intervention (N = 10)

	Pay Attention! intervention group (*n*=5)				Test-only control group (*n*=5)			
	Range	M (*SD)*	*t/W*	*p*	Range	M (*SD)*	*t/W*	*p*
Anxious/ depressed								
Pre [a]	57-70	63.40 (6.07)			51-62	56.40 (5.23))		
Post [b]	54-69	62.60 (6.11)	0.57	.596	50-62	56.80 (5.07)	-0.27	.803
Withdrawn/ depressed								
Pre [a]	50-70	58.40 (8.99)			50-66	55.20 (6.87)		
Post [b]	50-66	57.60 (7.80)	1.00	.374	50-66	56.00 (6.63)	-1.00	.374
Somatic complaints								
Pre [a]	50-64				50-70	60.00 (8.46)		
Post [b]	50-70		-1.60 [c]	.109	53-68	59.80 (6.69)	0.22	.838
Internalising problems								
Pre [a]	50-68	61.20 (7.53)			45-68	57.40 (8.20)		
Post [b]	50-70	61.60 (7.89)	-0.39	.717	41-68	56.60 (10.14)	0.65	.554
Rule-breaking behaviour								
Pre [a]	50-64	55.40 (5.41)			53-70	61.20 (6.30)		
Post [b]	50-67	57.60 (7.83)	-1.28	.269	51-74	58.00 (9.62)	1.22	.291
Aggressive behaviour								
Pre [a]	52-78	66.60 (9.48)			50-68			
Post [b]	55-67	61.20 (5.36)	1.54	.198	50-68		-.27[c]	.786
Externalising problems								
Pre [a]	49-73	63.40 (9.02)			48-68		-.73[c]	.465
Post [b]	51-67	59.60 (7.20)	1.19	.301	48-72			
Attention problems								
Pre [a]	61-71	66.80 (3.96)			57-83	67.80 (10.06)		
Post [b]	55-61	58.20 (2.29)	4.50	.011*	53-77	66.60 (8.85)	.41	.706
ADHD problems								
Pre [a]	62-75	69.00 (4.64)			62-80	71.80 (9.18)		
Post [b]	55-69	60.00 (5.34)	4.68	.009*	53-77	67.00 (10.07)	0.81	.466
ODD problems								
Pre [a]	55-73	64.40 (6.58)			52-67	59.60 (6.03)		
Post [b]	52-62	56.60 (3.91)	2.03	.133	52-73	61.00 (9.95)	-0.44	.680

Note. [a]Pre = Pre-intervention [b]Post =Post intervention [c]Wilcoxin matched-pair signed-rank test

* $p < 0.05$

Table 12

Parent's behavioural assessment (VABS-II): Within-group Comparisons for Pay Attention! intervention and Test-only control group from pre- to post-intervention (N = 10)

	Pay Attention! intervention group (*n*=5)				Test-only control group (*n*=5)			
	Range	M (*SD*)	*t/W*	*p*	Range	M (*SD*)	*t/W*	*p*
Receptive								
Pre [a]	11-14	12.40 (1.14)			8-13	10.60 (2.07)		
Post [b]	9-16	11.60 (2.70)	0.78	.477	7-11	9.20 (1.48)	1.30	.263
Expressive								
Pre [a]	10-23	16.20 (4.82)	-1.43	.227	9-16	12.80 (2.59)	1.18	.305
Post [b]	13-23	17.80 (4.55)			10-13	11.60 (1.14)		
Written								
Pre [a]	9-20	13.60 (4.22)	0.27	.799	6-17	11.80 (4.15)	-0.26	.807
Post [b]	10-17	13.40 (3.05)			11-14	12.20 (1.30)		
Communication								
Pre [a]	31-55	42.00 (9.03)	-0.33	.759	27-46	35.20 (7.05)	1.02	.365
Post [b]	32-54	42.80 (9.63)			31-37	33.00 (2.35)		
Personal								
Pre [a]	10-23				11-22			
Post [b]	11-54		-2.02 [c]	.043*	10-22		-1.83	.068[a]
Domestic								
Pre [a]	12-23				13-17			
Post [b]	12-19		-0.14 [c]	.891	10-15		-1.84 [c]	.066
Community								
Pre [a]	11-24	15.20 (5.26)	-0.74	.499	12-17	15.00 (2.12)	-0.19	.856
Post [b]	12-20	16.60 (3.44)			11-23	15.40 (4.56)		
Daily living								
Pre [a]	30-70	43.60 (15.45)	-1.37	.243	36-55	48.20 (7.19)	1.49	.209
Post [b]	35-63	50.40 (10.04)			31-59	42.80 (10.13)		
Interpersonal relationships								
Pre [a]	13-19	15.40 (2.30)	-2.45	.070	11-21	14.00 (4.12)	0.38	.721
Post [b]	15-19	17.20 (1.79)			11-16	13.20 (1.92)		
Play and leisure								
Pre [a]	10-21	14.00 (4.36)	0.00	1.00	9-14	12.00 (2.12)	0.98	.385
Post [b]	12-17	14.00 (2.00)			8-15	10.60 (2.70)		
Coping skills								
Pre [a]	14-18	16.00 (1.58)	-0.37	.729	13-16	14.40 (1.34)	0.14	.893
Post [b]	14-19	16.40 (1.95)			10-18	14.20 (3.03)		
Socialisation								
Pre [a]	37-58		-0.94[c]	.345	33-50	40.40 (6.19)	0.68	.534
Post [b]	45-51				29-47	38.00 (6.96)		
ABC								
Pre [a]	63-98	84.40 (15.24)	-1.20	.297	74-98		-1.75[c]	.080
Post [b]	62-113	91.40 (19.23)			51-98			

Note. Note. [a]Pre = Pre-intervention [b]Post =Post intervention [c]Wilcoxin matched-pair signed-rank test.
ABC = Adaptive Behaviour Composite
* $p < 0.05$

Case studies

I will now present the case studies for each participant in the Pay Attention! intervention group.

Case study 1: CH.

Demographic and familial information. CH is a 7-year-old female. She lives with her parents and her older brother who is 8. The family live in a middle SES suburb in the Cape Town area. Her parents are employed; her mother is self-employed and her father works in a senior management position. Both her parents have a history of Attention Deficit Disorder (ADD) and her brother has a diagnosis of ADHD.

Developmental history. CH's mother provided the following information during the history taking session while CH was undergoing the pre-assessment phase of the study. There were no reported complications during the pre- or perinatal periods and all CH's developmental milestones were reported to be normal, except for speech. CH took longer than expected to speak and construct sentences, and struggled to pronounce particular letters. CH's mother reported that CH had difficulty separating from her mother until about the age of 2 years, and currently tends to collect objects, possibly in an obsessive manner. Since CH was 5 years old and in grade RR, her teachers have reported that CH is an enthusiastic girl who easily gets involved in tasks, however, is easily distracted and tends to become tearful when she does not like something or struggles with a task. CH was referred to an occupational therapist approximately 1 year ago (grade R) for an assessment for ADD due to the family history of ADD, in conjunction with the reports by her teachers. Since being diagnosed with ADD, CH has been on medication. She initially did not respond well to the LA (Long Acting) Ritalin and is currently on 27mg Concerta and responding well to medication.

Academic history. At the time of the study CH was in Grade 1 at a mainstream school where she had been a pupil for approximately 18 months (since Grade R). CH's teacher of 4 months at the time of the study described CH as fidgety, distracted and talkative. The teacher also reported that CH has difficulty with structure, routine and time management. Academically CH is performing well and there has been no need for learner support.

Description of CH's matched control, MP. CH's matched control was a 7-year-old female in Grade 2 at a Special Needs School where she had been a pupil since the beginning of the year of the study. MP's teacher describes her as a hard working and diligent student who struggles to pay attention during class. At the time of the pre-assessment, MP's mother reported that there were no complications during the pre- or perinatal period. MP's mother did smoke during her pregnancy. At the time of the study MP's mother was unemployed and her father was deceased. MP is on medication for ADHD.

Assessment results. The results for general intellectual functioning for CH and her control are presented in Table 13.

Table 13
General Intellectual Functioning : WASI Scores for CH and her Control (N = 2)

Measure	Participants	
	CH	Test-only control
VIQ[a]	98	73
PIQ[a]	117	85
FSIQ[a]	108	76

Note. [a]IQ index scores are presented. WASI = Wechsler Abbreviated Scale of Intelligence. VIQ = Verbal IQ. PIQ = Performance IQ. FSIQ = Full Scale IQ.

CH's FSIQ was higher than that of her control counterpart, with her scores being in the Average range (see Table 13). CH's control counterpart had an FSIQ that falls within the Borderline range (see Appendix M for qualitative description of WASI scores).

CH tended to perform better than her matched control on most tests of attention/concentration, memory and executive functions at both pre- and post intervention assessment (see Table 14).

Table 14
Attention, Memory and EF Outcomes for CH and her Control (N =2)

		Participants			
		CH		Test-only control	
Domain	Battery/Subtest	T1	T2	T1	T2
Attention and concentration	TEA-Ch				
Selective attention	Sky Search Target	14	14	9	7
	Sky Search Timing	1	2	1	1
Sustained attention	Score!	6	9	4	1
Selective/divided attention	Sky Search DT	8	6	1	1
Attentional control	Opposite Worlds	2	4	1	1
Concentration	Numbers Forward	11	11	5	4
Memory	CMS				
Verbal Memory	Word List Learning	12	16	1	3
	Word List Delayed	10	17	4	6
	Word List Recognition	13	13	2	2
Visual Memory	Dot Locations Learning	11	14	10	10
	Dot Locations Total	12	15	10	10
	Dot Locations Delayed	13	13	5	10
Executive Functions	CMS				
Working memory	Numbers backward	9	7	3	6
	NEPSY II				
Inhibition	Naming	10	10	2	2
	Inhibition	9	13	8	8
	Switching	9	13	8	8
Inhibition-CT	Naming	8	8	5	5
	Inhibition	12	11	19	19
	Switching	10	10	19	19
Inhibition errors	Total errors	10	13	1	2

Note. T1 = Time 1, or pre-intervention; T2 = Time 2, or post-intervention; DT = Dual task; CT = Completion time.

Pay Attention! intervention. CH was enthusiastic to begin the intervention. She reported feeling excited at our first session and this sense of excitement and enjoyment appeared to continue throughout the intervention phase. She particularly enjoyed the House Search task and although she performed well in the auditory attention tasks she reported that this was her least favourite. With each session CH appeared to progress and she generally tended to move onto new tasks every 3 sessions, as the programme is designed. CH completed the Sustained Attention and Selective Attention domain tasks and had started on the Alternating Attention domain task by the end of the 24 sessions. She did not begin the Divided Attention domain task. CH attended 20 of the 24 Pay Attention! intervention sessions. Two sessions that she missed were due to school holidays and two sessions were missed because her mother had work commitments she needed to attend.

Individual comparison: RCI analysis. The individual change analysis for CH and her control is presented in Table 15. It would appear that across most cognitive and behavioural measures, CH tended to experience more significantly meaningful individual change when compared to her control, MP.

Table 15
RCI Analyses: Cognitive and behavioural domains: CH and her Control (N=2)

Domain	Subtest	Group	
		Pay Attention! intervention	Test-only control
Cognitive measures			
Attention and concentration[a]	Opposite Worlds	▼	
Memory	Word List Learning	▼▼▼	▼
	Word List Delayed	▼▼▼	
	Dot Locations Learning	▼	
	Dot Locations Total	▼	
	Dot Locations Delayed		▼▼
Executive functions	Numbers backward		▼
	Inhibition Switching CT	▼	▼
Behavioural measures			
BRIEF parent report	Initiate	▼▼▼	▼
	Working memory	▼▼▼	
	Plan/organise	▼▼	
	Monitor	▼▼	
	MI	▼▼▼	
BRIEF teacher report	Inhibit	▼▼▼	
	Shift	▼▼▼	
	Emotional control	▼▼▼	
	BRI	▼▼▼	
	Initiate	▼	
	Working memory	▼▼	
	Plan/organise	▼▼	▼
	Organisation of materials		▼
	Monitor	▼▼	
	MI	▼▼	
	GEC	▼▼▼	
CBCL teacher report	Somatic complaints		▼▼▼
	Internalising problems		▼▼
	Aggressive behaviour	▼▼▼	
	Externalising behaviour	▼▼▼	
	Attention problems	▼▼▼	▼▼▼
	ADHD problems	▼▼▼	▼▼▼
	ODD problems	▼▼▼	
VABS	Daily living		▼▼
	ABC		▼▼▼

Note. ▼= a positive change of at least 1 standard deviation with a confidence interval of 68.26%; ▼▼ = a positive change of at least 1.96 standard deviations with a confidence interval of 95%; ▼▼▼ = a positive change of at least 2.58 standard deviations with a confidence interval of 99%.
[a]Test-retest reliability coefficients were only available for the following Tea-Ch subtests included in the test battery: Sky Search Time per Target, Sky Search Attention Score, Score, Sky Search DT, and Opposite world. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite. ABC= Adaptive Behaviour Composite

Case study 2: JH.

Demographic and familial information. JH is an 8-year-old male. He lives with his parents and his younger sister who was 7 at the time of the study. The family live in a middle-SES suburb in the Cape Town area. JH's father works in a Senior Management position and his mother is self-employed.

Developmental history. The following information was reported by JH's mother during the history taking session, while JH took part in the pre-assessment phase of the study. JH's mother reported no difficulties or concerns during her pregnancy; however, her labour with JH was extremely long, lasting almost 48 hours, resulting in maternal and infant distress. JH reached all developmental milestones as expected. According to his mother, as a 2-year-old, JH was 'hyperactive, impulsive yet a very dear and sweet loving child'. She also reported that JH was emotionally reactive and experienced night terrors, and as a result would have difficulty getting to sleep. JH also experienced some difficulty with fine motor skills and was referred to an occupational therapist whom he saw approximately once a week from 2010 until 2013. When JH entered Grade R, approximately 4 years ago, he was referred to an Educational Psychologist for an assessment, as his parents, who both have ADD, were concerned about his hyperactivity, impulsivity and emotional reactions, and how this may impact his performance in school. JH was diagnosed with ADHD and started medication, which is now being managed by a paediatric neurologist. His current medication dosage is 54mg Concerta and 5mg Ritalin in the morning.

Academic history. At the time of the study JH was in Grade 3 at a mainstream school where he had been a pupil for approximately 4 years (since Grade R). JH's teacher of 4 months at the time of the study described JH as intelligent. Academically JH was performing well and he had been in the top 5% of his class for Grades 1 and 2. His current teacher was concerned about his academic performance and queried whether the longer school day, and

thus the need to concentrate for an extended period, had influenced his performance. JH's mother reported that his medicine dosage was increased slightly at the beginning of 2014 to accommodate the longer school day.

Description of JH's matched control PM. PM was an 8-year-old boy in Grade 3 at a mainstream school. He was described by his teacher as inattentive and as a distraction in class. PM lives in a middle-SES suburb of Cape Town with his mother, father and older sister. Both PM's parents are employed. PM has a comorbid diagnosis of ODD. He is on medication, however which medication and exact dosage is unknown.

Assessment results. The results for general intellectual functioning for JH and his control are presented in Table 16.

Table 16
General Intellectual Functioning : WASI Scores for JH and his Control (N = 2)

	Participants	
Measure	JH	Test-only control
VIQ[a]	121	93
PIQ[a]	99	77
FSIQ[a]	111	83

Note. [a]IQ index scores are presented. WASI = Wechsler Abbreviated Scale of Intelligence. VIQ = Verbal IQ. PIQ = Performance IQ. FSIQ = Full Scale IQ.

JH's FSIQ was higher than that of his control counterpart (see Table 16). JH scored in the High Average range while his control counterpart scored in the Low Average range (see Appendix M for qualitative description of WASI scores). JH's performance was largely consistent with that of his control counterpart at both pre- and post-intervention assessment on measures of attention/concentration and executive functions, with exception of selective, sustained and divided attention where JH performed more poorly. However, JH tended to perform better on measures of memory (see Table 17).

Table 17
Attention, Memory and EF Outcomes for JH and his Control (N =2)

		Participants			
		JH		Test-only control	
Domain	Battery/Subtest	T1	T2	T1	T2
Attention and concentration	TEA-Ch				
Selective attention	Sky Search Target	11	11	11	9
	Sky Search Timing	3	4	8	7
	Sky Search Attention Score	4	4	9	8
Sustained attention	Score!	7	6	12	10
Selective/divided attention	Sky Search DT	1	1	8	1
Attentional control	Opposite Worlds	4	5	3	1
Concentration	Numbers Forward	12	10	15	10
Memory	CMS				
Verbal Memory	Word List Learning	9	16	9	9
	Word List Delayed	8	14	12	16
	Word List Recognition	10	13	5	10
Visual Memory	Dot Locations Learning	13	13	7	16
	Dot Locations Total	15	12	8	14
	Dot Locations Delayed	12	16	10	9
Executive Functions	CMS				
Working memory	Numbers backward	13	13	13	14
	NEPSY II				
Inhibition	Naming	6	6	14	13
	Inhibition	13	9	13	8
	Switching	9	10	8	12
Inhibition-CT	Naming	9	10	11	9
	Inhibition	11	10	6	9
	Switching	11	9	9	13
Inhibition errors	Total errors	9	8	6	12

Note. T1 = Time 1, or pre-intervention; T2 = Time 2, or post-intervention; DT = Dual task; CT = Completion time.

Pay Attention! intervention. JH was eager to begin the intervention. He reported feeling excited at our first session, and this sense of excitement and enjoyment appeared to continue throughout the intervention phase. JH particularly enjoyed the House Search task,

and mentioned that he struggled with auditory tracks that served as distracters during the Selective Attention task. With each session JH appeared to progress, and he generally tended to move onto new tasks every 3 sessions, as that programme is designed. JH completed the Sustained Attention, Selective Attention domain tasks and had started on the Alternating Attention domain task at programme completion. He did not begin the Divided Attention domain task. JH attended 20 of the 24 Pay Attention! intervention sessions. JH's mother was unable to bring him to two sessions because she had work commitments to attend and he missed two other sessions during the school holiday period.

Individual comparison: RCI analysis. The individual change analysis for JH and his control is presented in Table 18. It would appear that across all cognitive and behavioural measures, JH tended to experience more significantly meaningful individual change when compared to his control, PM.

Table 18
RCI Analyses: Cognitive and behavioural domains: JH and his Control (N=2)

Domain	Subtest	Group	
		Pay Attention! intervention	Test-only control
Cognitive measures			
Memory	Word List Learning	▼▼▼	
	Word List Delayed	▼▼	▼
	Word List Recognition	▼	▼▼
	Dot Locations Learning		▼▼▼
	Dot Locations Total		▼▼▼
Executive functions	Inhibition-Switching CT	▼▼▼	
Behavioural measures			
BRIEF parent report	Inhibit	▼	
	Shift	▼▼	
	Emotional control	▼▼▼	▼▼
	BRI	▼▼▼	▼
	Initiate	▼	▼
	Plan/organise	▼	
	Monitor	▼	
	MI	▼	
	GEC	▼▼	
BRIEF teacher report	Inhibit	▼	
	Shift	▼▼	
	Emotional control	▼▼▼	
	BRI	▼▼▼	
	Initiate	▼▼	
	MI	▼	
	GEC	▼▼▼	
CBCL parent report	Aggressive behaviour	▼▼▼	
	Externalising behaviour	▼▼▼	
	Attention problems	▼▼	
	ADHD problems	▼▼	▼▼
	ODD problems	▼▼	
CBCL teacher report	Anxious/depressed	▼	▼
	Withdrawn/depressed	▼	
	Somatic complaints		▼▼
	Internalising problems	▼	▼▼▼
	Aggressive behaviour	▼	
	Externalising behaviour	▼	
	ODD problems	▼	

Note. ▼= a positive change of at least 1 standard deviation with a confidence interval of 68.26%; ▼▼ = a positive change of at least 1.96 standard deviations with a confidence interval of 95%; ▼▼▼ = a positive change of at least 2.58 standard deviations with a confidence interval of 99%.
[a]Test-retest reliability coefficients were only available for the following Tea-Ch subtests included in the test battery: Sky Search Time per Target, Sky Search Attention Score, Score, Sky Search DT, and Opposite world. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite. ABC= Adaptive Behaviour Composite.

Case study 3: CS.

Demographic and familial information. CS is an 8-year-old male. He lives with his mother, his older sister, his aunt and her young baby, and his mother's cousin and his son who is approximately the same age as CS. CS was living with his maternal grandmother until the beginning of the current year. It is unclear as to why he was living with her and why he moved back to live with his mother. The family live in a low-to-middle SES suburb in the Cape Town area. His parents are not married and do not have a stable relationship; they often separate and his father leaves the home. His mother was unemployed at the time of the study. She has a Grade 10 level of education and has previously worked as a teacher's aide in a crèche. His father works in the field of security and armed response.

Developmental history. The following information was received from CS's mother and his mother's cousin at the time of the history taking session, while CS was taking part in the pre-assessment phase of the study. When she was 5 months pregnant, CS's mother was hospitalised for approximately 3 weeks for a kidney infection. Besides this incident, she reported that there were no additional complications pre- or perinatally, and she was uncertain about whether the kidney infection may have effected CS, who was born at term. CS's developmental milestones were reported to be in the normal range. He began to walk at approximately 11 months and said his first word at approximately 14-15 months. CS's mother reported no notable concerns about her son and his development or behaviour prior to the age of 5. His mother reported that he is currently struggling emotionally, banging his head and scratching himself. His mother enquired about possible intervention, and was provided with the details of the process at the CGC.

Academic history. CS was enrolled in Grade R (final year of pre-school prior to entering Junior School) at a mainstream school. His mother and teacher noted that he was fidgety and restless. He was referred to the community clinic nurse who did not believe that

there was anything untoward about his behaviour. CS progressed to Grade 1, however, he was struggling academically, and he was referred to a special needs school for the following year where he repeated Grade 1. He was diagnosed and prescribed medication for ADHD at the special needs school in 2013. CS was in Grade 2 at the time of the study at a special needs school in the Cape Town area. CS's current teacher reports that he is a good student; that he is diligent and aims to please in class. His teacher added that he does struggle at times to complete tasks and appears to find it difficult emotionally if he believes he has done something wrong.

Description of CS's matched control, AM. AM was an 8-year-old boy who lived with his mother, father and older sister in a middle SES suburb of Cape Town. Both his parents are employed. His sister has a diagnosis of ADD. AM is in grade 3 at a mainstream school. His mother and his teacher reported that he struggles in some classes and could benefit from taking part in some of the learner support classes, however, these classes are only made available to students in Grade 4 and older. AM has a co-morbid diagnosis of ODD and was taking medication for ADHD.

Assessment results. The results for general intellectual functioning for CS and his control are presented in Table 19.

Table 19
General Intellectual Functioning : WASI Scores for CS and his Control (N = 2)

	Participants	
Measure	CS	Test-only control
VIQ[a]	84	131
PIQ[a]	79	131
FSIQ[a]	79	135

Note. [a]IQ index scores are presented. WASI = Wechsler Abbreviated Scale of Intelligence. VIQ = Verbal IQ. PIQ = Performance IQ. FSIQ = Full Scale IQ.

CS's FSIQ was lower than that of his control counterpart (see Table 19). CH's FSIQ falls within the Borderline range while his control counterpart falls within the Very Superior

range (see Appendix M for qualitative description of WASI scores). CS tended to perform more poorly than his matched control counterpart on most tests of attention/concentration, memory and executive functions at both pre- and post-intervention assessment (see Table 20).

Table 20
Attention, Memory and EF Outcomes for CS and his Control (N =2)

		Participants			
		CH		Test-only control	
Domain	Battery/Subtest	T1	T2	T1	T2
Attention and concentration	TEA-Ch				
Selective attention	Sky Search Target	3	4	11	13
	Sky Search Timing	7	5	2	1
	Sky Search Attention Score	9	8	1	1
Sustained attention	Score!	4	1	12	13
Selective/divided attention	Sky Search DT	1	1	10	8
Attentional control	Opposite Worlds	1	1	4	3
Concentration	Numbers Forward	7	6	10	12
Memory	CMS				
Verbal Memory	Word List Learning	3	7	7	19
	Word List Delayed	7	8	11	16
	Word List Recognition	2	5	5	13
Visual Memory	Dot Locations Learning	5	8	10	11
	Dot Locations Total	5	9	10	12
	Dot Locations Delayed	10	10	12	8
Executive Functions	CMS				
Working memory	Numbers backward	6	5	13	10
	NEPSY II				
Inhibition	Naming	1	1	8	9
	Inhibition	2	5	13	7
	Switching	-	2	9	8
Inhibition-CT	Naming	1	1	11	5
	Inhibition	4	4	11	5
	Switching	-	4	10	13
Inhibition errors	Total errors	3	1	9	8

Note. T1 = Time 1, or pre-intervention; T2 = Time 2, or post-intervention; DT = Dual task; CT = Completion time.

Pay Attention! intervention. The Pay Attention! intervention was conducted at CS's school. He was often absent from school for various reasons, and as a result he attended only 12 of the 24 sessions. Of the 12 sessions he missed, 6 were due to school absenteeism and 6 were missed because he was unable to attend sessions during school holidays as his mother was not able to bring him to sessions with me at the CGC. His mother reported that she would not be able to take time off work to bring him to sessions at the CGC. There was nobody else available who could bring him to sessions during the school holiday period. CS lived in an area of Cape Town that was unsafe to travel to due to the increased gang violence that was taking place. CS was eager to begin the Pay Attention! Intervention, and this excitement appeared to continue throughout the intervention. CS appeared to try really hard in each session, and seemed disappointed when he learned that he had made mistakes. With each session CS appeared to struggle to make consistent progress and as a result did not generally move onto new tasks every 3 sessions as the programme is designed. CS completed the Sustained Attention and Selective Attention domain tasks and had started on one Alternating Attention domain task by programme completion. He did not begin the Divided Attention domain task.

Individual comparison: RCI analysis. The individual change analysis for CS and his control is presented in Table 21. With regard to individual change, both CS and his control, AM, appeared to experience limited significantly meaningful change. On the cognitive measures subtests where CS and AM did experience change, AM experienced change at a higher confidence interval. There was no significantly meaningful individual change for CS on the parent rated BRIEF or VABS-II, however, on the parent rated CBCL Attention Problems index, CS did experience a positive change at the 95% confidence interval. On the teacher rated CBCL, a positive change at the 68.26% confidence interval was reported for CS

on the ADHD problems index. These positive changes were not matched by his control, however, a positive change was reported on the VABS-II for his control.

Table 21
RCI Analyses: Cognitive and behavioural domains: CS and his Control (N=2)

Domain	Subtest	Group	
		Pay Attention! intervention	Test-only control
Cognitive measures			
Memory	Word List Learning	▼▼	▼▼▼
	Word List Delayed		▼▼
	Word List Recognition	▼	▼▼▼
	Dot Locations Learning	▼	
	Dot Locations Total	▼	
Executive functions	Inhibition-Naming CT	▼▼	▼▼▼
	Inhibition-Inhibition CT		▼▼
Behavioural measures			
BRIEF parent report	Shift		▼
BRIEF teacher report	Emotional control	▼▼▼	
	Monitor		▼
CBCL parent report	Attention problems	▼▼▼	
	ODD problems	▼	
CBCL teacher report	ADHD problems	▼	
VABS	Daily living		▼▼▼
	Personal		▼
	Socialisation		▼
	ABC		▼▼▼

Note. [a]Age at post-assessment ▼= a positive change of at least 1 standard deviation with a confidence interval of 68.26%; ▼▼ = a positive change of at least 1.96 standard deviations with a confidence interval of 95%; ▼▼▼ = a positive change of at least 2.58 standard deviations with a confidence interval of 99%. [b]Test-retest reliability coefficients were only available for the following Tea-Ch subtests included in the test battery: Sky Search Time per Target, Sky Search Attention Score, Score, Sky Search DT, and Opposite world. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite. ABC= Adaptive Behaviour Composite.

Case study 4: LE.

Demographic and familial information. LE is a 6-year-old boy. He lives in a low-to-middle SES suburb in the Cape Town area. He lives with his mother and his maternal grandmother. His father is not present in the home, however, he sees his father intermittently. His father has a grade 12 level of education and works in a clerical position and provides a small amount of financial support each month. His mother did not complete

high school and at the beginning of the study she was unemployed. She did, however, find employment at a local supermarket while the study was in process.

Developmental history. LE's mother provided limited information during the history taking session and the post-assessment session. LE's mother appeared to be hesitant to discuss her pregnancy with LE in detail, reporting 'all fine' to most questions. Thus, it is unclear as to whether there were any complications during the pre- or perinatal period and whether there were any complications in achieving developmental milestones. LE was diagnosed with ADHD when he was approximately 2 or 3 years old. LE's mother did not provide detail as to how the diagnosis came about. LE has been taking medication for ADHD since his diagnosis. He was taking Ritalin 3 times per day; 10mg early morning, 5mg late morning and 5mg mid afternoon. In the last month of the intervention, LE's medication dosage was changed. At the time of the post-assessment, LE was taking LA Ritalin 20mg in the early morning, 5mg Ritalin at lunchtime and mid-afternoon. LE also takes 3mg Melatonin in the early evening. LE has a comorbid diagnosis of ODD. LE's mother did not provide further detail regarding his ODD diagnosis, and referred to a report she would send. However, on further follow-up the report was not received.

Academic history. At the time of the study, LE was in grade R at a Special Needs School. LE's mother did not provide further detail as to how it came about that LE was enrolled at the school. LE's teacher reported that LE is a pleasant and easy child to have in the class when he had taken his medication. However, when LE had not taken his medication his teacher described him as distracted, restless, impulsive, hyperactive, and disruptive. LE's teacher reported that in a group setting LE appeared to be more distracted than when he was in a one-to-one situation.

Description of LE's Control, OF. OF was a 6-year-old boy who was in Grade 1 at a mainstream school. His teacher reported that he performed well in school except in literacy.

He was also described by his teacher as being inattentive and anxious. OF lived in a middle SES suburb of Cape Town with his parents, both of whom were employed, and his two older brothers. His eldest brother has a diagnosis of ADHD. OF was on medication for ADHD.

Assessment results. The results for general intellectual functioning for LE and his control are presented in Table 22.

Table 22
General Intellectual Functioning : WASI Scores for LE and his Control (N = 2)

	Participants	
Measure	LE	Test-only control
VIQ[b]	99	81
PIQ[b]	97	97
FSIQ[b]	99	87

Note. [a]IQ index scores are presented. WASI = Wechsler Abbreviated Scale of Intelligence. VIQ = Verbal IQ. PIQ = Performance IQ. FSIQ = Full Scale IQ.

LE's FSIQ was higher than that of his control counterpart (see Table 22). LE's FSIQ was in the Average range while his control counterpart was in the Low Average range (see Appendix M for qualitative description of WASI scores). LE tended to perform relatively consistently with his control counterpart on tests of attention/concentration (with exception of sustained attention where he performed more poorly), memory and executive functions (see Table 23).

Table 23
Attention, Memory and EF Outcomes for LE and his Control (N =2)

		Participants			
		LE		Test-only control	
Domain	Battery/Subtest	T1	T2	T1	T2
Attention and concentration	TEA-Ch				
Selective attention	Sky Search Target	10	10	8	11
	Sky Search Timing	12	7	8	8
	Sky Search Attention Score	12	6	8	8
Sustained attention	Score!	5	9	12	12
Selective/divided attention	Sky Search DT	1	1	1	1
Attentional control	Opposite Worlds	9	11	11	11
Concentration	Numbers Forward	8	8	5	5
Memory	CMS				
Verbal Memory	Word List Learning	5	9	12	14
	Word List Delayed	8	13	10	12
	Word List Recognition	3	11	10	11
Visual Memory	Dot Locations Learning	10	9	10	14
	Dot Locations Total	11	10	10	15
	Dot Locations Delayed	14	12	10	11
Executive Functions	CMS				
Working memory	Numbers backward	8	11	9	13
	NEPSY II				
Inhibition	Naming	4	5	6	5
	Inhibition	9	9	7	8
Inhibition-CT	Naming	7	11	9	9
	Inhibition	10	12	12	12
Inhibition errors	Total errors	7	5	1	1

Note. T1 = Time 1, or pre-intervention; T2 = Time 2, or post-intervention; DT = Dual task; CT = Completion time.

Pay Attention! intervention. LE was excited to begin the Pay Attention! intervention and generally appeared eager at each session. However, he tended to be easily distracted at times. LE attended sessions at his school. His teacher mentioned that on several occasions

he had not yet taken his medication prior to our session. On the days when he appeared to be more distracted he was fidgety and had difficulty listening to instructions and following through on the tasks. One or two of these days LE's teacher was certain that he had not yet taken his medication. However, there were three occasions when his teacher was uncertain as to whether he had taken his medication. He mentioned that he was disappointed that the intervention had to end.

LE attended 14 of the 24 Pay Attention! intervention sessions. Of the 10 sessions that he missed, 6 were due to school holidays and 4 were as a result of school absenteeism. His mother reported that she had started a new job and she was unable to bring LE to sessions at the CGC during the school holidays. Unfortunately no one else was available or had the means to transport him during that time. LE's mother had kept him home from school on at least two occasions during the intervention so she could spend time with him when she did not have a shift at her new job. LE missed school on one occasion during the intervention to attend a doctor's appointment at the hospital. I discussed the possibility of make-up sessions with LE's mother. The make-up sessions would have needed to take place at the CGC as he lived in an area that was prone to gang warfare at the time. On several occasions LE's mother did not respond to phone calls and/or messages requesting make-up sessions. On one occasion she said she would bring him, however, she did not arrive for the appointment. On follow-up she said it would not be possible for her to take time off from her new job.

With each session LE appeared to struggle to make consistent progress, and as a result did not generally move onto new tasks every 3 sessions as the programme is designed. LE completed the Sustained Attention and Selective Attention domain tasks and had one session on Alternating Attention domain task. He did not begin the Divided Attention domain task.

Individual comparison: RCI analysis. The individual change analysis for LE and his control is presented in Table 24. It would appear that across all cognitive and behavioural

measures, LE tended to experience more significantly meaningful individual change when compared to his control, OF.

Table 24
RCI Analyses: Cognitive and behavioural domains: LE and his Control (N=2)

Domain	Subtest	Group: Pay Attention! intervention	Group: Test-only control
Cognitive measures			
Attention and concentration[a]	Score	▼▼	
	Opposite Worlds	▼	
Memory	Word List Learning	▼▼	▼
	Word List Delayed	▼▼	
	Word List Recognition	▼▼▼	
	Dot Locations Learning		▼
	Dot Locations Total		▼▼
Executive functions	Numbers backward	▼	▼
	Inhibition-Inhibition CT		▼▼▼
	Inhibition Total Errors	▼▼▼	▼
Behavioural measures			
BRIEF parent report	Inhibit	▼	
	Shift	▼▼▼	
	BRI	▼	
	Working memory	▼	
	GEC	▼▼▼	
BRIEF teacher report	BRI	▼▼	
CBCL parent report	Aggressive behaviour	▼▼▼	
	Externalising behaviour	▼▼	
	ADHD problems	▼	
	ODD problems	▼▼▼	
CBCL teacher report	Anxious depressed	▼	
	Internalising behaviour	▼▼▼	▼
	Aggressive behaviour	▼	
	Externalising behaviour	▼	
	Attention problems	▼▼	▼▼
	ADHD problems	▼▼▼	▼
	ODD problems	▼	
VABS	Communication	▼	
	Daily living	▼	▼▼▼
	Personal		▼
	Socialisation	▼	▼▼
	ABC	▼▼▼	▼▼▼

Note. ▼= a positive change of at least 1 standard deviation with a confidence interval of 68.26%; ▼▼ = a positive change of at least 1.96 standard deviations with a confidence interval of 95%; ▼▼▼ = a positive change of at least 2.58 standard deviations with a confidence interval of 99%.
[a]Test-retest reliability coefficients were only available for the following Tea-Ch subtests included in the test battery: Sky Search Time per Target, Sky Search Attention Score, Score, Sky Search DT, and Opposite world. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite. ABC= Adaptive Behaviour Composite.

Case study 5: LT.

Demographic and familial information. LT is a 7-year-old boy who lives with his parents and younger brother, aged 4. They live in a middle-SES suburb in the Cape Town area. His paternal grandmother lives nearby and he spends two afternoons a week with her, and spends time with her regularly on weekends. Both his parent are employed. His mother is self-employed and his father is in business management.

Developmental history. The following information was received from LT's mother telephonically prior to LT taking part in the pre-assessment phase of the study. Further information was received from his mother and paternal grandmother during the intervention when either of them brought LT to sessions. LT's mother reported that there were no complications during the pre- and perinatal periods. LT was born at term and his developmental milestones were reported to be normal.

When LT was approximately 2 years old, his mother noted that she was worried about him as he was 'edgy, emotional, had mood swings, and was behaving out of sorts'. LT's mother was referred to a paediatric neurologist at this time, who then referred LT to an occupational therapist. By the age of 31/2 years, LT's mother noted that she did not believe that he had improved and that she was concerned about LT's social and behavioural development. At this time the paediatric neurologist prescribed Ritalin. LT's mother reported that at times the medication was effective and at other times, not, which made her question LT's use of it. LT has been on several different medications for ADHD and at differing doses.

LT does not have many friends and has difficulty interacting with other children. As a result, LT and his family are somewhat socially isolated as LT's mother says they do not go out to social events often because his behaviour is unpredictable. LT was referred to a child

psychiatrist earlier in the year for assessment of his emotional difficulties. The psychiatrist did not change LT's medication, nor did he provide a clear diagnosis.

LT's father was diagnosed with ADD last year. After learning more about ADHD when LT was diagnosed, his father could relate to many of the symptoms and was assessed by a psychologist. He initially tried medication, however, he did not believe that it had much benefit for him and has since tried behavioural changes, which he believes have benefitted him. LT's mother reported that she suffers from anxiety but is not currently being treated for it. At the start of the study LT was on 54mg Concerta and Risperlet. His medication did change during the course of the intervention which will be discussed further.

Academic history. LT was enrolled at a special needs school when he was 3 years old. It is a small private school with classes of approximately 5 students per class which the paediatric neurologist believed would suit LT and his social difficulties. It is a relatively new school and at this stage does not have grades higher than Grade 2. LT's mother noted that she would prefer for LT to be transferred to a mainstream school to complete his schooling. The psychiatrist LT was referred to recommended that LT remain in his current school for an additional year to work on the social and behavioural difficulties he experiences. LT's teacher reported that he does have difficulty interacting with classmates, maintains poor eye contact, is easily distracted and has difficulty finishing tasks**.**

Description of LT's control, EP. EP was a 7-year-old boy who was in grade 2 at a mainstream school. He had recently enrolled at this school as he was expelled from his previous school for disruptive behaviour. His mother reported that he had excelled at his new school and that his behaviour appeared to have settled. He had also started medication since enrolling at his new school. His teacher confirmed what his mother reported, expressing that EP is hard working and diligent, and more focussed and settled since enrolling in his new

school. EP lives with his parents, who are both employed, in a middle SES suburb of Cape Town. He does not have siblings.

Assessment results. The results for general intellectual functioning for LT and his control are presented in Table 25.

Table 25
General Intellectual Functioning : WASI Scores for LT and his Control (N = 2)

	Participants	
Measure	LT	Test-only control
VIQ[a]	91	103
PIQ[a]	121	114
FSIQ[a]	106	109

Note. [a]IQ index scores are presented. WASI = Wechsler Abbreviated Scale of Intelligence. VIQ = Verbal IQ. PIQ = Performance IQ. FSIQ = Full Scale IQ.

LT's FSIQ was similar to that of his control counterpart with both in the Average range (see Table 25) (see Appendix M for qualitative description of WASI scores). LT tended to perform relatively consistently with his matched control on pre- and post-intervention measures of attention (with exception of sustained and selective/divided attention and concentration), memory and executive functions (see Table 26).

Table 26
Attention, Memory and EF Outcomes for LT and his Control (N =2)

		Participants			
		LT		Test-only control	
Domain	Battery/Subtest	T1	T2	T1	T2
Attention and concentration	TEA-Ch				
Selective attention	Sky Search Target	16	16	14	14
	Sky Search Timing	10	13	2	13
	Sky Search Attention Score	9	12	1	13
Sustained attention	Score!	6	7	15	15
Selective/divided attention	Sky Search DT	1	1	1	12
Attentional control	Opposite Worlds	7	8	10	10
Concentration	Numbers Forward	7	10	15	15
Memory	CMS				
Verbal Memory	Word List Learning	7	10	7	15
	Word List Delayed	9	13	9	14
	Word List Recognition	7	11	10	8
Visual Memory	Dot Locations Learning	9	15	10	13
	Dot Locations Total	14	10	10	15
	Dot Locations Delayed	10	14	12	12
Executive Functions	CMS				
Working memory	Numbers backward	8	16	10	10
	NEPSY II				
Inhibition	Naming	9	15	5	8
	Inhibition	7	15	6	8
Inhibition-CT	Naming	12	13	10	11
	Inhibition	9	14	10	11
Inhibition errors	Total errors	8	14	7	10

Note. T1 = Time 1, or pre-intervention; T2 = Time 2, or post-intervention; DT = Dual task; CT = Completion time.

Pay Attention! intervention. During the intervention LT was often ill with a persistent cough and cold-like symptoms. LT's mother and grandmother were concerned as he was prescribed medication, antibiotics and cortisone, which they believed affected his mood and concentration. He attended several doctors' appointments while taking part in the

intervention. Approximately mid-way through the intervention period, LT's mother reported that his cough and cold-like symptoms could possibly be a side-effect of medication he was taking for ADHD. As a result, his medication dosage was adjusted and he was prescribed additional medication including an anxiolytic.

During the Pay Attention! intervention, LT presented as self-willed and appeared to have difficulty listening to instruction and sitting still. At the beginning of the intervention period LT appeared eager to begin the intervention, however, he appeared to have difficulty engaging and interacting. He appeared easily distracted by outside noises and on several occasions he wanted to leave the room to find his mother or his grandmother. LT appeared to have difficulty engaging for the full 45-minute period, and would ask how much longer we would be busy and how many more tasks he needed to complete. At the end of each session LT was eager to leave the room and had difficulty waiting for me to pack up and walk out with him. Towards the end of the 12-week intervention period LT appeared less eager to participate in sessions and required much encouragement on the part of myself and his mother or grandmother for him to begin and engage with the session.

With each session LT appeared to struggle to make consistent progress and as a result did not generally move onto new tasks every 3 sessions as the programme is designed. LT completed the Sustained Attention, Selective Attention domain tasks and had started on the Alternating Attention domain task by programme completion. He did not begin the Divided Attention domain task. LT attended 19 of the 24 Pay Attention! intervention sessions.

Individual comparison: RCI analysis. The individual change analysis for LT and his control is presented in Table 27. Across all cognitive and behavioural measures, LT's control, EP, tended to experience more significantly meaningful individual change. On cognitive measures where positive change was reported for both LT and EP, EP experienced change at a greater confidence interval compared to LT. Limited significantly meaningful

individual change was reported for LT on both parent and teacher rated measures of behaviour, with no change above the 68.26% confidence interval.

Table 27
RCI Analyses: Cognitive and behavioural domains: LT and his Control (N=2)

Domain	Subtest	Group	
		Pay Attention! intervention	Test-only control
Cognitive measures			
Attention and concentration[a]	Sky Search Timing	▼	▼▼▼
	Sky Search Attention Score	▼	▼▼▼
	Sky Search DT		▼▼▼
	Numbers forward	▼	
Memory	Word List Learning	▼	▼▼▼
	Word List Delayed	▼	▼▼
	Word List Recognition	▼▼	▼▼▼
	Dot Locations Learning	▼▼▼	▼
	Dot Locations Total		▼▼
	Dot Locations Delayed	▼	
Executive functions	Numbers backward	▼▼▼	
Behavioural measures			
BRIEF parent report	Inhibit		▼▼▼
	Shift		▼▼▼
	Emotional control	▼	
	BRI	▼	▼▼▼
	Initiate		▼▼▼
	Working memory		▼▼▼
	Plan/organise		▼▼▼
	Organisation of materials	▼	▼▼▼
	Monitor		▼▼▼
	MI		▼▼▼
	GEC		▼▼▼
CBCL parent report	Rule breaking behaviour		▼▼▼
	Aggressive behaviour		▼▼▼
	Externalising behaviour		▼▼▼
	Attention problems		▼▼
	ADHD problems	▼	▼▼▼
	ODD problems		▼
CBCL teacher report	Withdrawn/depressed	▼	
	Internalising problems	▼	
VABS	Communication	▼	▼
	Personal		▼

Note. ▼= a positive change of at least 1 standard deviation with a confidence interval of 68.26%; ▼▼ = a positive change of at least 1.96 standard deviations with a confidence interval of 95%; ▼▼▼ = a positive change of at least 2.58 standard deviations with a confidence interval of 99%.
[a]Test-retest reliability coefficients were only available for the following Tea-Ch subtests included in the test battery: Sky Search Time per Target, Sky Search Attention Score, Score, Sky Search DT, and Opposite world. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite. ABC= Adaptive Behaviour Composite.

CHAPTER 5: DISCUSSION AND CONCLUSION

Introduction

This chapter will start with a summary and discussion of the findings of the current research. The efficacy of the Pay Attention! intervention will be addressed followed by a discussion about the feasibility of the Pay Attention! intervention, linking the findings of the current research to previous international literature. The chapter will conclude with a discussion of limitations of the current study and recommendations for future research.

Hypothesis

The hypothesis for this study was that training on multiple dimensions of attention using the Pay Attention! intervention would result in significant improvements in attentional functioning in children aged 6 to 8 years with a diagnosis of ADHD as compared to children who do not receive any intervention (Test-only group). Specifically, I expected that there would be more change on cognitive and behavioural measures in the Pay Attention! experimental group when compared to the Test-only control group at post-intervention assessment. However, I found no significant change on cognitive measures in the Pay Attention! intervention group when compared to the Test-only control group. I also did not find significant change on cognitive measures within the Pay Attention! intervention group from pre- to post-testing sessions, independent of the Test-only group.

However, contrary to these non-significant findings, in terms of the RCI results there were a number of significant reliable changes on the cognitive measures (attention and concentration, memory and executive function) and the parent and teacher rated behavioural measures.

On the behavioural measures there was significant change for the Pay Attention! intervention group when compared to the Test-only control group in two domains of the parent VABS-II; the VABS-II Socialisation domain and the Expressive and the Interpersonal

relationships subdomain. Within the Pay Attention! intervention group there was significant change from pre- to post-test on the CBCL Attention problems and ADHD problems indices and the VABS-II Personal subdomain that were not observed in the Test-only group.

I therefore reject my hypothesis and retain my null hypothesis.

Efficacy

While the primary goal of the current study was to determine feasibility of the Pay Attention! intervention, it was also critical to collect some outcome data to establish, even preliminarily, whether the intervention resulted in any changes in neuropsychological functioning and/or behaviour prior to possibly initiating a larger study.

Cognitive measures. The non-significant findings regarding the between-group comparisons and within-group comparisons from pre- to post-intervention on the cognitive measures does not corroborate with findings in previous studies (Kerns et al., 1999; Tamm et al., 2010; 2013). However, the direction of group means, although not statistically significant, was in the expected direction for the Pay Attention! intervention group on measures of basic attention, verbal memory, working memory and inhibition with small to medium effect sizes. However, similar trends can also be noted in the Test-only control group. The direction of group means on the cognitive measures for the Test-only control group appear to be higher at post-intervention compared to pre-intervention on measures of selective attention, divided attention, visual memory, working memory and inhibition. This trend in the direction of group means was not expected for the Test-only group. It is possible that these changes could be due to either practice or familiarity effects on the measures themselves.

In psychology, however, when interpreting the evidence for efficacy of interventions, the over-reliance on significance testing has been heavily criticised (Fritz, Scherndl, & Kühberger, 2012; Harrison, Thompson, & Vannest, 2009; Thompson, 2002). Therefore, the

American Psychological Association has recommended supplementing the *p* value with additional elements such as effect sizes, statistical power and confidence intervals (Fritz et al., 2012; Thompson, 2002). In terms of confidence intervals I will discuss those in relation to the RCI results as an indication of evidence of change. I will now discuss these three elements with regard to the cognitive measures.

Effect sizes. It is necessary to include a measure of effect size for the reader to appreciate the magnitude or importance of a study's findings (Fritz et al., 2012; Harrison et al., 2009; Thompson, 2002). On examination of effect sizes for the neuropsychological composites and other outcome variables, changes in the expected direction were observed for the Pay Attention! intervention group compared to the Test-only control group on measures of Basic Attention, Divided Attention, Verbal Memory and Visual Memory with a decrement (moderate to large effect size) for Inhibition. Although non-significant, examination of these effect sizes suggests that the result could reach significance on neuropsychological composites and other outcome variables if the sample were a larger for the participants receiving the Pay Attention! intervention.

Power. When applying inferential statistics, the statistical power considerations associated with hypothesis testing needs to be taken seriously in order to provide evidence that the study has sufficient power to correctly reject the null hypothesis (APA, 2010; Fritz et al., 2012). I did a post hoc power analysis for the neuropsychological composites and other outcome variables to determine what sample size would be needed to reject the null hypothesis for the neuropsychological measures. The necessary sample size was much larger than the sample in this study (*N*= 128). The power on each of the composites and other outcomes varied from .03 to .15, thus there was not sufficient power to detect significant treatment effects of the Pay Attention! intervention on cognitive measures.

Confidence intervals. Confidence intervals present information of how precisely or how accurately a population parameter can be estimated and describe a likely range of values. In this study I used the RCI to determine whether any changes in individual participant's scores from pre- to post-intervention assessments were clinically meaningful at three different confidence intervals: 68.26%, 95% and 99%. Since the sample size was small it is necessary to consider each individual participant's pre- and post-intervention assessment scores to determine the trend in scores. On perusing the post-assessment scores of participants in the Pay Attention! intervention group, it would appear that there was improvement for three of the five participants; namely CH, JH and LT. This improvement was not matched by CH and JH's control, however LT's control, EP, did have attention and concentration scores that could be considered clinically meaningful at the 99% confidence interval. During the post-intervention assessment, EP's mother reported that in the approximately three months since we had met, he had 'excelled'. By excelling she meant that he had adjusted well to his medication, he was in a new environment i.e. he started a new school and had settled into his new school and enjoyed his new teacher. As a result he appeared to be more focused in class, and she believed his confidence and mood had improved. He was performing well at school and in his extramural activities. This was confirmed by his teacher and also reflected in the parent and teacher rated behavioural reports. Thus despite receiving no intervention, improved performance outcomes were observed for EP which may be as a result of being in a suitable school environment, taking part in extra mural activities as well as complying with medication dosage. There did not appear to be substantial change for two participants, LE and CS, the two participants that attended approximately half of the intervention sessions, 54% and 50% respectively. Similar findings were observed for LE and CS matched controls.

On measures of verbal memory, CS did not display individual change on the delayed measure. LT, JH and LE, and CH experienced individual change at the 68.26%, 95% and 99% confidence intervals respectively. This level of change was not evident in all the matched controls.

On measures of visual memory, LE, CH, JH and CS did not display any individual change while LT displayed individual change at the 68.26% confidence interval that was not evident in his matched control. On examination of the pre- and post-intervention Visual Memory assessment scaled scores, CH, JH and LE scored in the 75-99 percentile rank, while LT scored in the 50-95 percentile rank and CS scored in the 5-50 percentile rank at both pre- and post-assessment. Thus, one might not expect to see a clinically meaningful change on measures of Visual Memory for LE, CH and JH as their pre-assessment scores were the same as or above 75% of children on the same measure. Reliable change, however, was not evident for CS, who did not attend 80% or more of the sessions. It is therefore possible that should the attendance rate have been 80% or more for all participants, I may have found significant treatment effects and/or more reliable individual change.

Behavioural measures. The overall non-significant findings regarding the between-group comparisons and within-group comparisons from pre- to post-intervention on the parent rated behavioural measures is not consistent with findings in previous studies (Tamm et al., 2010; 2013). The BRIEF, CBCL and VABS-II are self-report measures that were included in order to measure whether changes in attention or executive-related domains could be generalised to everyday behaviour at home or at school. However, there are limitations to self-report measures and the bias in these kinds of measures is widely known (Holden & Troister, 2009).

Parent and teacher ratings of executive function. The direction of group means, although not statistically significant, was in the expected direction for the Pay Attention!

intervention group parent and teacher rated BRIEF. These findings are generally consistent with those of the previous trials of Pay Attention! which reported non-significant results but means in the expected direction and improvement in effect size from pre- to post-testing on all BRIEF subscales (Kerns et al., 1999; Tamm et al., 2010; 2013). The subscales of the BRIEF capture a wide variety of skills, including the ability to initiate tasks independently, solve problems, sequence steps, plan ahead, organise work and play, implement strategic memory, manage cognitive tasks, and self-monitor performance. With these skills in mind and Fritz et al. (2012) and Thompson's (2002) suggestion to consider the effect size, power and confidence intervals, rather than over relying on the *p* value, I will now discuss the results for the parent and teacher rated BRIEF.

RCI. Examination of the RCI analyses for each Pay Attention! intervention participant, reflect reliable change on the parent rated BRIEF at the 95-99% confidence interval for CH, JH and LE which was not matched by their individual controls. There was no change for CS and nor was their change for his control. There was reliable change at the 68.26% confidence interval observed for LT (Emotional Control, BRI, and Organisation of Materials indices), however his control reflected greater reliable change.

On the teacher rated BRIEF, examination of the RCI analyses for each participant, reflect clinically meaningful change at the 95-99% confidence interval, on various subscales (all subscales with exception of Initiate and Organisation of Materials), for CH and JH which was not matched by their individual controls. For LE and CS, there was clinically meaningful change on two of the subscales, Behaviour Regulation Index (95%) and Emotional Regulation (99%), respectively which was not evident in their individual matched controls. No change was observed for LT, however there was reliable individual change observed for his matched control, EP.

In terms of Executive Function, the Pay Attention! intervention there appears to have been a reliable change, according to her mother's report, on CH's ability to begin tasks or activities and independently generate problem-solving strategies (Initiate), her capacity to hold information in mind for purposes of completing tasks (Working Memory) and her ability to initiate, plan, organise and self-monitor (Metacognition Index) at the 99% confidence interval. In addition, CH's ability to manage current and future-oriented tasks (Plan/Organise) and her ability to self-monitor and monitor tasks (Monitor) improved at the 95% confidence interval. CH's teacher's report corroborates with her mother's report, and in addition her ability to resist impulses (Inhibit), to move freely form one situation, activity or aspect of a task (Shift) to another, modulate or control her emotional responses (Emotional Control), shift cognitive set and modulate emotions and behaviour (Behaviour Regulation Index) and her overarching ability to self-regulate her behaviour and to select and sustain actions (Global Executive Composite) improved at the 99% confidence interval. These improvements were not observed for CH's matched control.

Reliable change was observed for JH in terms of Executive function on parent and teacher rated reports. Specifically JH's ability to modulate or control his emotional responses (Emotional Control), shift cognitive set and modulate emotions and behaviour (Behaviour Regulation Index) and his overarching ability to self-regulate his behaviour and to select and sustain actions (Global Executive Composite) improved at the 99% confidence interval. JH's ability to move freely from one situation, activity or aspect of a task (Shift) to another, and to begin tasks or activities and independently generate problem-solving strategies (Initiate) improved at the 95% confidence interval, and his ability to resist impulses (Inhibit) and organise and self-monitor (Metacognition Index) at the 66.28% confidence interval. In addition, reliable change was observed for JH's parent rated report on measures of his ability to manage current and future-oriented tasks (Plan/Organise) and to self-monitor and monitor

tasks (Monitor) at the 68.26% confidence interval. These improvements were not observed for JH's matched control.

According to LE's mother, in terms of Executive Function, he improved on measures of his ability to move freely from one situation, activity or aspect of a task (Shift) to another and his overarching ability to self-regulate his behaviour and to select and sustain actions (Global Executive Composite) at the 99% confidence interval. At the 68.26% confidence interval he improved on measures of his ability to resist impulses (Inhibit), shift cognitive set and modulate emotions and behaviour (Behaviour Regulation Index), and his capacity to hold information in mind for purposes of completing tasks (Working Memory). These observations were not corroborated by his teacher report. These improvements were not observed for LE's matched control.

Reliable change was not observed for LT except on measures of his ability to modulate or control his emotional responses (Emotional Control), to shift cognitive set and modulate emotions and behaviour (Behaviour Regulation Index), and his ability to organise, keep track of and/or clean up his belongings (Organisation of Materials), which improved at the 68.26% confidence interval. However, his matched control's Executive Function improved at the 99% confidence interval on the following subscales: Inhibit, Shift, Initiate, Working Memory, Plan/Organise, Organisation of Materials and Monitor and Behaviour Regulation Index, Metacognition Index and Global Executive Composite. It is interesting to consider both LT and his matched control's mothers' description of their children's behaviour. At the pre- and post-intervention assessment as well as at intervention sessions, LT's mother described him as experiencing emotional, social and behavioural difficulties. She described him as having mood swings and as getting upset very easily, having difficulty tolerating change, displaying high levels of physical activity, being self-willed and as having a poor ability to self-monitor. As mentioned in the case study, LT attends a special needs

school for children with learning and behavioural difficulties. On the other hand, LT's matched control, EP, was described by his mother at the pre-intervention assessment as 'extremely difficult' until towards the end of the year prior to the study commencing. By 'difficult', she meant that he displayed high levels of hyperactivity and inappropriate behaviour and that he was expelled from school in grade 2 as a result of his behaviour. At the post-intervention, she described him as making a '180 degree turn around', as previously mentioned. The verbal reports given by these two mothers could explain the difference in outcomes on behavioural measures for these two participants.

Overall, it would appear that a direct treatment approach such as that utilized by the Pay Attention! intervention can show favourable results in terms of parent and teacher ratings of Executive Function. However, it necessary to consider each child individually taking into account co-morbid diagnoses and psychosocial factors. Thus, perhaps there is a need for individual interventions designed to suit the specific needs of individual participants (Hodgkins et al., 2013).

Parent and teacher rated Child Behaviour Checklist. The significant within-group treatment effects for the Pay Attention! intervention group on measures of Attention Problems and ADHD Problems on the parent rated CBCL is consistent with findings in previous studies (Tamm et al., 2010; 2013). The means were in the expected direction for the following CBCL subscales: Anxious/ Depressed, Withdrawn/ Depressed, Aggressive Behaviour, Externalising Problems and ODD Problems. Although I expected to find significant effects on teacher rated measures of Attention and ADHD symptoms on the CBCL, the non-significant treatment effects that were observed in this study correlate with findings by Tamm et al. (2013). However, although non-significant, the means on these two scales were in the expected direction for both the Pay Attention! intervention group and the Test-only control group with medium to large effect sizes. It is possible that the findings in

this study were affected by the Hawthorne effect; the parents and teachers were aware that they were being observed and as a result may have modified their responses accordingly (Salkind, 2008). Thus it is possible that the parents, in comparison to the teachers, may have over or under exaggerated the child's ADHD symptoms and behavioural problems during pre- and post-assessment, respectively, in order to make them fit with their expectations. Hence, this may be a possible reason for the discrepancy in significant results for the teacher rated behavioural measures compared to the parent rated behavioural measures. In addition, the school and home environment is different in terms of the number of children per parent/teacher, there are possibly more distractions in the school environment and it is possible that some teachers may lack knowledge about ADHD (Massman, Nussbaun, & Bigler, 1998; Perold et al., 2010).

RCI. On the Attention Problems scale clinically meaningful treatment effects were observed for CS, LE and CH at 68.26%, 95% and 99% respectively. There was no change observed for LT and JH.

On closer examination of the teacher rated CBCL reports, at both pre- and post-intervention assessment, on the Attention Problems and ADHD subscale, CS's scores for both Inattention and Hyperactivity-Impulsivity were within the normal range. Thus, his post-assessment score may have improved only slightly, remaining in the normal range as evident by his observed reliable change at the 68.26% confidence interval. At pre-intervention assessment, LE's score for Inattention was in the normal range on the Attention Problems and ADHD Problems subscale while his score for Hyperactivity-Impulsivity was high enough to warrant concern on both subscales (Attention Problems and ADHD Problems). At post-intervention assessment, LE's scores for Inattention and Hyperactivity-Impulsivity were in the normal range on both the Attention Problems and ADHD Problems subscales, and hence his clinically meaningful improvement at the 95% confidence interval. CH, at pre-

intervention assessment, had scores for both Inattention and Hyperactivity-Impulsivity that were high enough to warrant concern on both the Attention Problems and ADHD Problems subscales. However, at post-intervention assessment, CH's scores for both Inattention and Hyperactivity-Impulsivity were in the normal range on both the Attention Problems and ADHD Problems subscales, and hence her clinically meaningful treatment effect at the 99% confidence interval.

For the two participants where no clinically meaningful change was observed, the teacher rated CBCL reports offer an explanation. It would appear that from pre- to post-intervention assessment, LT scored more poorly on the Attention Problems subscale. At pre-assessment his scores for both Inattention and Hyperactivity-Impulsivity were in the normal range on both the Attention Problems and ADHD Problems subscales. However, at post-assessment, LT's scores for Inattention on the Attention Problems scale remained in the normal range, while his Hyperactivity-Impulsivity score increased and was considered high enough to warrant concern. At post-assessment his Inattention and Hyperactivity-Impulsivity scores remained in the normal range on the ADHD Problems subscale however. As mentioned in the case study, LT's medication dosage was decreased during the intervention due to adverse side effects. It is therefore possible that on a lower dosage his teacher would have observed an increase in Hyperactive and Impulsive behaviour.

There was no change from pre- to post-intervention assessment for JH. His scores for both Inattention and Hyperactivity-Impulsivity were in the normal range for both the Attention Problems and ADHD subscale and thus no clinically meaningful treatment effect was noted.

Parent rated VABS-II. The VABS-II can be used to measure an individual's daily functioning, deficits in adaptive behaviour, emotional disturbances, and as a progress monitor during treatment. Since individuals with ADHD typically have difficulty with

developmentally appropriate social and academic functioning, the significant treatment effects observed on the Socialisation domain and the Interpersonal and Expressive subdomain, potentially show promise for the Pay Attention! intervention in terms of these ADHD-related symptoms. This finding correlates with the significant treatment effect observed for Attention Problems and ADHD Problems on the parent rated CBCL.

In sum, the results of this intervention may appear somewhat positive for components of some outcome measures. However, these results still amount to limited efficacy for the intervention in this specific study.

The ethics of implementing an intervention with limited efficacy. Overall, despite the limited evidence for the efficacy of the Pay Attention! intervention, examination of effect sizes, although non-significant, revealed small to moderate changes for the Pay Attention! intervention group on cognitive measures and teacher and parent behaviour ratings, and most importantly in ADHD symptoms. Furthermore, group means, although not statistically significant, were in the expected direction. However, there is an ethical question to consider and that is whether an intervention such as Pay Attention! should be implemented if there is only limited efficacy?

One point to consider might be that only interventions with proven high efficacy should be implemented since it may be difficult to justify the costs involved in running interventions with low efficacy. However, another point might be that even though an intervention programme may have limited efficacy and therefore be beneficial to only a few people, long-term and potential adverse effects of ADHD supports the notion that one should implement such an intervention. Furthermore, implementing and adjusting interventions with limited efficacy may afford the opportunity to build on and refine new intervention programmes that would be suitable for specific contexts. Thus, the outcome observed in the

current study presents such an opportunity and offers ideas for development and refinement of the Pay Attention! intervention.

Feasibility

Attendance. Attendance was acceptable for three participants, CH, LT, and JH, who were able to attend sessions at the CGC as a caregiver who owns a motor vehicle was able to bring them to sessions twice a week, including during school holidays. For these participants, the caregiver was also self-employed and/or worked flexible hours and was therefore able to take time off during working hours to bring the child to sessions. Once per week LT's grandmother would bring him to the sessions while his mother would bring him to the second session. Similarly, JH's father would occasionally bring him to sessions when his mother was not available. This attendance rate was particularly impressive given that children were attending sessions twice a week for a period of 3 months.

However, on the point of attendance, this was poor for participants, LE and CS, even though they were being seen in their school setting. LE and CS were absent from school on 4 and 6 occasions, respectively. In addition, LE and CS's caregivers did not own a motor vehicle and relied on public transport, which was considered to be expensive and unreliable. Furthermore, CS and LE's caregivers were not able to take time off work to accompany them to sessions during the 3-week school vacation period. As a result, both LE and CS missed a further 6 successive sessions each. There was unfortunately not another responsible adult/caregiver that could bring CS and LE to the CGC for sessions during the school holidays. In addition, LE and CS lived in an area of Cape Town that is notorious for its high incidence of crime and gangsterism and thus due to safety it was not ideal for me to travel on my own to LE's or CS's homes for sessions during the school vacation. As a result, attendance rate for these two participants was poor. Therefore, when considering the implementation of the Pay Attention! intervention in the future, it would be important to take

each individual participant's psychosocial factors into consideration i.e. where they live, access to transport and availability of responsible adults to accompany them to sessions. As the facilitator of the intervention, it would be important to ensure that there is sufficient time in the schedule to be able to accommodate missed sessions.

When recruiting children and organising an intervention period, it would be helpful, if possible, to group children according to area and potentially see them on the same day. This would decrease travel time and the facilitator would therefore be more readily available. Another consideration is to start an intervention period as soon as possible into the new school term. In this way, poor attendance due to school vacation may be controlled for. Since there are no official training qualifications for the Pay Attention! intervention, teachers could possibly be trained to administer the intervention. This could have a positive effect on attendance as teachers see class members on a daily basis and could thus possibly administer the intervention during a break in the school day or after school hours. However, this would add to the workload of teachers as the Pay Attention! intervention is designed to be administered repetitively and on an individual basis and thus the teacher would potentially be using much of their own free time to administer the intervention. In addition, the treatment is data-based and requires the facilitator to take time between each session to determine whether to continue, modify or terminate a particular training activity.

Parents' feedback. During the post-intervention assessment, the parents and participants reportedly liked the intervention and believed that it had helped to improve attention. However, CH, JH and LT's mothers reported that towards the end of the intervention period, the mothers experienced the number of sessions to be overwhelming. These mothers suggested the possibility of a shorter intervention period with the same number of sessions i.e. more sessions per week over a shorter period of time. This is worthy of considering in future studies as it could possibly improve attendance rates, specifically

reducing sessions missed due to absenteeism. Similarly, a shorter intervention period overall may reduce the number of sessions missed due to school holidays for children who take part in the intervention at their school. On the other hand, it may not be possible to take a child out of class on a daily basis. It would be necessary to make arrangements to see the child after school hours but on the school premises. However, in making such arrangements one should consider the fact that attention tends to wane as the day progresses, and therefore an intervention of this nature is best administered as early as possible during the day, or after school if necessary.

On this point, something to consider would be how the child gets to and from school generally. For example, in this study, LE and CS used the school transport, which departed as soon as classes ended for the day. Thus it was not possible to see them after class, which further impacted on accessibility and attendance. Therefore, what may be suitable for one child may not necessarily be suitable for another. Again one would need to consider carefully each participant's psychosocial factors and schedules, which would be in line with the individualised treatments advocated by researchers in the field (Hodgkins, Dittmann, Sorooshian, & Banaschewsi, 2013).

Consistent with findings reported by Sciberras et al. (2010), the parents in this study were interested to know more about the intervention and how to possibly to be more involved. One parent suggested that perhaps they could receive supplemental materials that described the materials and tasks. In addition, perhaps parents could be involved in the session in some way. An idea might be to invite the parent into the room following each session where the child could give feedback about the tasks they completed during the session. The parents could then be coached to reinforce opportunities to practice the skills at home. If the parent is involved in this way and has more knowledge of what their child is doing, this may also encourage parents to ensure that their child does attend all the sessions.

The parents' involvement could possibly result in significant treatment effects being observed on post-assessment cognitive and behavioural measures.

In terms of everyday behaviour, CH, JH and LE's mothers reported improvements in memory and concentration, less impulsivity, improved mood with less angry outbursts and less 'wild' and disruptive behaviour. These behavioural changes were not observed in their matched controls. Thus it is possible that participating in the intervention affected behavioural change. However, the behavioural change may have come about as a result of one-on-one attention paid to the children over the course of three months. In addition, the mother's were aware that their children were being observed and as a result may have modified their responses accordingly. However, this was not the case for CS and LT. CS's mother reported that he appeared to be more emotional with more angry and tearful outbursts, he was not performing as well in school and appeared to have difficulty with concentration and was more anxious and forgetful. However, CS attended only 50% of the intervention sessions. However, CS's mother raised concern during the intervention regarding the possibility of discord in CS's home. It is possible that conflict within his family may raise his anxiety which in turn would affect his concentration and mood (Scholtens et al., 2012; Sørensen et al., 2011). LT's mother reported that she was not aware of behavioural changes in LT during the intervention. However, she did mention that it was difficult to determine positive behavioural change as LT tended to have an unpredictable cycle of improvement in mood and behaviour which would then deteriorate. As a result, LT's mother was consulting with several medical professionals to determine the cause of and effective treatment for LT.

The parents were also interested in what the possible long-term effects might be following participation in the Pay Attention! intervention. Further research is therefore warranted with specific emphasis on the long-term effects of the Pay Attention! intervention.

Obtaining permission from the parents to contact the teacher directly proved to be beneficial in collecting teacher data, as recommended by Tamm et al. (2010), as all teachers returned the behavioural assessment forms at pre- and post-intervention assessment.

Participants' feedback. All the participants readily engaged with the tasks and appeared to enjoy the Pay Attention! materials. None of the participants appeared to have difficulty understanding the task demands, and thus it would appear that the linguistic and problem-solving demands of the tasks were appropriate for the age range of participants in this study. This is noteworthy as an important principle of attention training is to ensure that the basic linguistic and problem-solving demands of the task are within the child's capability. If this is the case then one could consider that it is in fact the attention demands of the tasks that are being manipulated (Kerns et al., 1999). Despite enjoying the intervention materials, the participants did appear to tire of the intervention by about week 8 to 10. This was particularly the case for participants LE, CS and LT who did not progress every 3 sessions as the intervention is designed.

The participants particularly liked the varied nature of the tasks i.e. using their hands to sort, drawing on the house, and using the clicker. Participants tended to repeat instructions to themselves as they worked through a task and appeared to be excited about their performance on completion of tasks. The auditory tasks tended to be more demanding than visual tasks; this may be due to the fact that they are more fleeting in nature and require a greater level of concentration. While some of the auditory tracks served the purpose of being a distracter (i.e. the music and the storytelling), others such as the baby crying and the laughing appeared to cause distress for 3 of the participants. It was noted that these 3 participants had a baby in the home and they were concerned about the baby when it cried. Thus they experienced distress as opposed to distraction during this component of the Pay Attention! intervention. The laughter was reported to sound more sinister than jovial by 3 of

the participants, and as a result, also had more of a distressing effect than fulfilling the function of a distraction.

The results from this study suggest that the Pay Attention! intervention is feasible to administer and acceptable to participants. In addition, the fact that it can be successfully administered by trained individuals without a clinical qualification also has positive implications in terms of programme dissemination.

Limitations and Directions for Future Research

The first, and primary limitation of this study is the sample size. For a quantitative study a sample size of 10 participants is considered to be small. Previous studies (Tamm et al., 2010; 2013) included larger sample sizes, with $n = 23$ and $n = 132$ participants, respectively. However, these studies included participants from a wider age range (7 to 15 years) and Tamm et al. (2010) did not include a control group. In this study, the small was chosen in order to keep control in terms of age as well as allow for including a control group. This sample size was also chosen due to the availability of time, financial and human resources for assessment and intervention purposes. In addition this study was a pilot study and thus the sample size was chosen accordingly. Due to the small sample size it is possible that there is in fact a difference between the pre- and post-intervention assessment scores and a type II error exists. In future follow-up studies I would recommend larger samples be recruited where resources, especially in terms of time, will not be limited. A larger sample size would in turn reduce the risk of a type II error.

A second limitation was that in spite of including a Test-only control group to control for maturation effects and test-retest effects, there was no group to control for whether it was the intervention that made a difference or the one-on-one attention paid to the children over the course of three months. It is also possible that positive outcomes could be the result of the latter and children being motivated to do better given the attention paid to them rather

than the effects of the intervention per se. In future studies a third control group should be included, such as an art group or a play group.

A third limitation, was this the possibility of the Hawthorne effect; the parents, teachers and participants were aware that they were being observed and as a result may have modified their responses accordingly (Salkind, 2008). In future studies, a third group could also be included, such as an art group or a play group, to control for the Hawthorne effect.

A fourth limitation of the study was that, due to absenteeism, midyear school vacation, as well as the participants' lack of access to transport, the intervention was not implemented for the optimal 12 week/ 24 session period for all participants. However, it is uncertain whether the extra sessions might have made a difference to the end results, taking into consideration each participant's psychosocial environment. In future it is recommended that the implementation of the intervention be designed to suit each participant's individual needs with a specific focus on the intervention venue as well as individual psychosocial factors (Hodgkins et al., 2013).

A final limitation was that the parents and teachers were not blind to group participation. The bias in self-report data is widely known and it is possible that the parents and/or teachers may have exaggerated the child's ADHD symptoms and behavioural problems in order to make their situation seem worse for the child to be included in the study (Holden & Troister, 2009). In a larger future follow-up study it is recommended that random assignment to groups be implemented and that parents and teachers are blind to group participation if possible.

Summary and conclusion

Overall, this study adds to the growing body of literature regarding the use of cognitive training for attentional, executive function, and behaviour change in children with ADHD. Although the results do not provide strong support for the efficacy of the

intervention, these findings are interpreted in light of a number of recognized limitations. Results in terms of the feasibility of the intervention in the South African context is however promising. Thus, before the Pay Attention! intervention can be considered for use in the South African setting, additional research is recommended. The optimal design for future studies would be an RCT which would include a larger sample size, blind evaluators at pre- and post intervention assessment, a control group that is designed to reduce expectancy bias and long-term follow-up.

However, it is necessary to take each individual's psychosocial factors into account in terms of access to transport, availability of responsible caregivers to bring them to sessions, home environment and where they live, the school setting, and medication status.

Despite these acknowledged shortcomings, this study represents a first step in further evaluating the Pay Attention! intervention for children with ADHD in an SA context, where cognitive rehabilitation, generally, is lacking. In addition, the results of the study also provide useful feedback regarding feasibility around the implementation of this type of intervention in this context, and a platform for expanding on this research in future.

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Appendix A

DSM-5 diagnostic criteria for ADHD

A. Either (1) and/or (2).

1. **Inattention**: Six (or more) of the following symptoms have persisted for at least 6 months to a degree that is inconsistent with developmental level and that impact directly on social and academic/occupational activities. Note: for older adolescents and adults (ages 17 and older), only 4 symptoms are required. The symptoms are not due to oppositional behaviour, defiance, hostility, or a failure to understand tasks or instructions.

(a) Often fails to give close attention to details or makes careless mistakes in schoolwork, at work, or during other activities (for example, overlooks or misses details, work is inaccurate).

(b) Often has difficulty sustaining attention in tasks or play activities (for example, has difficulty remaining focused during lectures, conversations, or reading lengthy writings).

(c) Often does not seem to listen when spoken to directly (mind seems elsewhere, even in the absence of any obvious distraction).

(d) Frequently does not follow through on instructions (starts tasks but quickly loses focus and is easily sidetracked, fails to finish schoolwork, household chores, or tasks in the workplace).

(e) Often has difficulty organizing tasks and activities. (Has difficulty managing sequential tasks and keeping materials and belongings in order. Work is messy and disorganized. Has poor time management and tends to fail to meet deadlines.)

(f) Characteristically avoids, seems to dislike, and is reluctant to engage in tasks that require sustained mental effort (such as schoolwork or homework or, for older adolescents and adults, preparing reports, completing forms, or reviewing lengthy papers).

(g) Frequently loses objects necessary for tasks or activities (e.g., school assignments, pencils, books, tools, wallets, keys, paperwork, eyeglasses, or mobile telephones).

(h) Is often easily distracted by extraneous stimuli (for older adolescents and adults may include unrelated thoughts).

(i) Is often forgetful in daily activities, chores, and running errands (for older adolescents and adults, returning calls, paying bills, and keeping appointments).

2. **Hyperactivity and Impulsivity**: Six (or more) of the following symptoms have persisted for at least 6 months to a degree that is inconsistent with developmental level and that impact directly on social and academic/occupational activities. Note: for older adolescents and adults (ages 17 and older), only 4 symptoms are required. The symptoms are not due to oppositional behaviour, defiance, hostility, or a failure to understand tasks or instructions.

(a) Often fidgets or taps hands or feet or squirms in seat.

(b) Is often restless during activities when others are seated (may leave his or her place in the classroom, office or other workplace, or in other situations that require remaining seated).

(c) Often runs about or climbs on furniture and moves excessively in inappropriate situations. In adolescents or adults, may be limited to feeling restless or confined.

(d) Is often excessively loud or noisy during play, leisure, or social activities.

(e) Is often "on the go," acting as if "driven by a motor." Is uncomfortable being still for an extended time, as in restaurants, meetings, etc. Seen by others as being restless and difficult to keep up with.

(f) Often talks excessively.

(g) Often blurts out an answer before a question has been completed. Older adolescents or adults may complete people's sentences and "jump the gun" in conversations.

(h) Has difficulty waiting his or her turn or waiting in line.

(i) Often interrupts or intrudes on others (frequently butts into conversations, games, or activities; may start using other people's things without asking or receiving permission, adolescents or adults may intrude into or take over what others are doing).

(j) Tends to act without thinking, such as starting tasks without adequate preparation or avoiding reading or listening to instructions. May speak out without considering consequences or make important decisions on the spur of the moment, such as impulsively buying items, suddenly quitting a job, or breaking up with a friend.

(k) Is often impatient, as shown by feeling restless when waiting for others and wanting to move faster than others, wanting people to get to the point, speeding while driving, and cutting into traffic to go faster than others.

(l) Is uncomfortable doing things slowly and systematically and often rushes through activities or tasks.

(m) Finds it difficult to resist temptations or opportunities, even if it means taking risks (A child may grab toys off a store shelf or play with dangerous objects; adults may commit to a relationship after only a brief acquaintance or take a job or enter into a business arrangement without doing due diligence).

B. Several noticeable inattentive or hyperactive-impulsive symptoms were present by age 12.

C. The symptoms are apparent in two or more settings (e.g., at home, school or work, with friends or relatives, or in other activities).

D. There must be clear evidence that the symptoms interfere with or reduce the

quality of social, academic, or occupational functioning.

E. The symptoms do not occur exclusively during the course of schizophrenia or another psychotic disorder and are not better accounted for by another mental disorder (e.g., mood disorder, anxiety disorder, dissociative disorder, or a personality disorder).

Specify Based on Current Presentation

Combined Presentation: If both Criterion A1 (Inattention) and Criterion A2 (Hyperactivity-Impulsivity) are met for the past 6 months.

Predominately Inattentive Presentation: If Criterion A1 (Inattention) is met but Criterion A2 (Hyperactivity-Impulsivity) is not met and 3 or more symptoms from Criterion A2 have been present for the past 6 months.

Predominately Hyperactive/Impulsive Presentation: If Criterion A2 (Hyperactivity-Impulsivity) is met and Criterion A1 (Inattention) is not met for the past 6 months.

Inattentive Presentation (Restrictive): If Criterion A1 (Inattention) is met but no more than 2 symptoms from Criterion A2 (Hyperactivity-Impulsivity) have been present for the past 6 months

Appendix B

Letter of participation for children with ADHD

Dear Parent/Guardian,

My name is Abigail Wilson and I am currently completing my Masters in Clinical Psychology at the University of Cape Town. I would like to invite you and your child to participate in my research, which is in partial fulfillment of my degree.

For my research, I am focusing on evaluating an attention training program for children who have been diagnosed with Attention Deficit Hyperactivity Disorder (ADHD). As you are aware children who have been diagnosed with ADHD may have difficulties with every day activities such as completing school work on time, or paying attention during tasks such as getting ready for school. International studies have shown that this attention training program is successful in improving attention in children who have been diagnosed with ADHD, and school work tends to improve. However, the program has not yet been studied in children in South Africa with ADHD. Because there is very limited research on this and other interventions of this nature, I cannot say whether it will definitely improve your child's attentional functioning. Part of the aim of this research is to investigate whether the program might lead to some improved attentional and memory functioning.

Your child will need to participate in approximately 3 hours of neuropsychological testing before and after the intervention. This is so that we can assess if the program is successful. You will also be required to fill out some questionnaires regarding your child's overall functioning. All testing will take place on one day at a time that is convenient for you, and transportation costs will be compensated. Regular breaks will be given, however if you feel that your child may not be able to concentrate for this amount of time, we can arrange for testing to take place over 2 days.

In order to ensure that my results are accurate, I will need to compare the results of children who take part in the intervention, to children who do not take part in them. I will be recruiting 5 children who receive the attention training program in the beginning and 5 children who will only be tested initially. These two groups will then be randomly assigned to the Intervention Group or Test-only Group. Should the attention training program be successful, then the children in the test-only group will also receive this intervention.

If your child is between the ages of 6 and 8 years, and has been diagnosed with ADHD according to the DSM-5 you are eligible to participate in this study. Children will be able to participate if they are currently taking medications such as Ritalin or Concerta, and if they are not taking medication, as long as their medication does not change during the intervention and testing. However, if your child has any developmental (e.g. learning disability) or neurological (e.g. epilepsy, infantile meningitis) you are ineligible to participate in this study.

Please note that participation is entirely voluntary and you may withdraw from the study at any time without stating a reason. Withdrawal will not disadvantage you in any way. Anonymity and confidentiality will be ensured as no names will be used in my report or on the test papers, and only my supervisor and I will be able to view the test scores. Results of

the study will be made available to you upon completion of the study, and the findings may be published in a scientific journal.

Should you wish to participate in my study or require more information, please contact me at your earliest convenience. Pre-testing will begin in April 2014, and the program will commence in May 2014.

Kind regards,

Abigail Wilson

0834488463

wilson_abigail@hotmail.com

Dr Leigh Schrieff

0216503708

l.e.schrieff@gmail.com

Appendix C

Parent Questionnaire and Asset Index

PARENT QUESTIONNAIRE AND ASSET INDEX

GENERAL INFORMATION

Full name (Parent):	
Telephone:	Work: ( ) Home: ( ) Cell:
Home language:	
Full name (Child):	
Gender:	M F
Date of birth:	
Grade:	

HOUSEHOLD INCOME: (Please circle appropriate number)

Household income per year:	1. R0 2. R1- R5 000 3. R5001- R25 000 4. R25 001- R100 000 5. R100 001 +

PARENTAL EDUCATION: (Please circle appropriate number)

	Biological mother	Biological father	Guardian
Highest level of education reached? Mark one response for each person as follows:			
1. 0 years (No Grades / Standards) = No formal education (never went to school)	1.	1.	1.
2. 1-6 years (Grades 1-6 / Sub A-Std 4) = Less than primary education (didn't complete primary school)	2.	2.	2.
3. 7 years (Grade 7 / Std 5) = Primary Education (completed primary school)	3.	3.	3.
4. 8-11 years (Grades 8-11 / Stds 6-9) = Some secondary education (didn't complete high school)	4.	4.	4.
5. 12 years (Grade 12 / Std 10) = Secondary education (completed senior school)	5.	5.	5.
6. 13+ years = Tertiary education (completed university / technikon / college)	6.	6.	6.
7. Don't know	7.	7.	7.

EMPLOYMENT: (Please circle appropriate number)

Hollingstead categories:	Biological mother	Biological father	Guardian
1. Higher executives, major professionals, owners of large businesses)	1.	1.	1.
2. Business managers of medium sized businesses, lesser professions (e.g. nurses, opticians, pharmacists, social workers, teachers)	2.	2.	2.
3. Administrative personnel, managers, minor professionals, owners / proprietors of small businesses (e.g. bakery, car dealership, engraving business, plumbing business, florist, decorator, actor, reporter, travel agent)	3.	3.	3.
4. Clerical and sales, technicians, small businesses (e.g. bank teller, bookkeeper, clerk, draftsperson, timekeeper, secretary)	4.	4.	4.
5. Skilled manual – usually having had training (e.g. baker, barber, chef, electrician, fireman, machinist, mechanic, painter, welder, police, plumber, electrician)	5.	5.	5.
6. Semi-skilled (e.g. hospital aide, painter, bartender, bus driver, cook, garage guard, checker, waiter, machine operator)	6.	6.	6.
7. Unskilled (e.g. attendant, janitor, construction helper, unspecified labour, porter, unemployed)	7.	7.	7.
8. Homemaker	8.	8.	8.
9. Student, disabled, no occupation	9.	9.	9.

MATERIAL AND FINANCIAL RESOURCES (ASSET INDEX): (Please circle appropriate number)

Which of the following items, in working order, does your household have?

Items	Yes	No
1. A refrigerator or freezer	1.	1.
2. A vacuum cleaner or polisher	2.	2.
3. A television	3.	3.
4. A hi-fi or music center (radio excluded)	4.	4.
5. A microwave oven	5.	5.
6. A washing machine	6.	6.
7. A video cassette recorder or dvd player	7.	7.

Which of the following do you have in your home?

Items	Yes	No
1. Running water	1.	1.
2. A domestic servant	2.	2.
3. At least one car	3.	3.
4. A flush toilet	4.	4.
5. A built-in kitchen sink	5.	5.
6. An electric stove or hotplate	6.	6.
7. A working telephone	7.	7.

Do you personally do any of the following?

Items	Yes	No
1. Shop at supermarkets	1.	1.
2. Use any financial services such as bank account, ATM card or credit card	2.	2.
3. Have an account or credit card at a retail store	3.	3.

Appendix D
Parent Consent Form

Dear Parent,

Informed Consent for you and your child to participate in research about an intervention to assist children with ADHD to concentrate better.

You are being invited to allow your child to take part in a research study, and also to participate yourself. This form provides you with information about the study and seeks your permission for the collection, use and disclosure of your child's neuropsychological rehabilitation and cognitive performance data, as well as other information necessary for the study. The Principal Investigator (the person in charge of this research), or a representative of the Principal Investigator, will also describe this study to you and answer all of your questions. Your and your child's participation is entirely voluntary. Before you decide whether or not to allow your child to take part, read the information below and ask questions about anything you do not understand. By allowing your child to participate in this study you will not be penalized or lose any benefits to which you would otherwise be entitled. Please note this research has been approved by the Faculty of Humanities' Human Research Ethics Committee at the University of Cape Town.

1. Title of Research Study

Implementation of an Attention Training Program with Children with Attention Deficit Hyperactivity Disorder in South Africa

2. Principal Investigator(s) and Telephone Number(s)

Leigh Schrieff, Ph.D.	Abigail Wilson (Masters Student)
Department of Psychology	Department of Psychology
University of Cape Town	University of Cape Town
l.e.schrieff@gmail.com	wilson_abigail@hotmail.com
021-650-3708	0834488463

3. Source of Funding or Other Material Support

National Research Foundation and The University of Cape Town's University Research Committee.

4. What is the purpose of this research study?

The purpose of this research is to investigate the effectiveness of the *Pay Attention!* intervention in improving attention in children who have Attention Deficit Hyperactivity Disorder (ADHD). *Pay Attention!*'s effectiveness will be compared to receiving no services. This research is being undertaken because of a need to provide effective services for children with ADHD in South Africa; this is the best method to assess the effectiveness of a programme.

5. What will be done if you take part in this research study?

You and your child will be asked to come to the University of Cape Town (UCT) or the Red Cross Hospital so that we can carry out some neuropsychological assessments. We will administer a series of tests that will examine your child's strengths and weakness, particularly with regards to his/her attention in various tasks. You will also be required to complete some questionnaires so that we have a better understanding of your child's performance at home and at school. These questionnaires take approximately one hour to complete and you will be able to complete these while your child is being assessed. With your permission, the Principal Investigator will also ask your child's teacher to complete similar forms, so that we have an holistic understanding of your child's functioning.

Once the assessment has been completed, children will be divided into groups and matched to other children with ADHD based on age, gender and medication status. Half of the children will receive the *Pay Attention!* programme now while the other half will receive no services for the moment (they will be offered *Pay Attention!* if we do find that it is effective).

7. If you choose to participate in this study, how long will you be expected to participate in the research?

If your child has been randomly assigned to receive *Pay Attention!* you will be asked to bring your child to UCT or Red Cross Children's Hospital for 1 hour twice a week for a period of 12 weeks. This will be arranged at a time that is convenient for you. Should you wish to participate in the study but are unable to bring your child to UCT, it may be possible to make alternative arrangements. You will then be asked to bring your child back to UCT (or an alternative venue) within 14 days of completion of the intervention for your child to be assessed again for a period of approximately 2 hours.

If your child is in the waitlist control group you will not be required to bring your child to UCT during this 12 week period. You will be asked to set aside approximately 3 hours for a first period of testing, and another 3 hours about twelve weeks later. If we find that *Pay Attention!* is successful, and you do decide to have your child participate in the programme, then you will be asked to bring your child to UCT for 1 hour twice a week for a period of 12 weeks. This will be arranged at a time that is convenient for you. Should you wish to participate in the study but are unable to bring your child to UCT, it may be possible to make alternative arrangements.

However, if at any time during the research period you feel that you do not wish to continue, you are free to discontinue your participation without penalty.

8. How many people are expected to participate in the research?
10 children and their parents/guardians/caregivers and teacher, 5 in each group.

9. What are the possible discomforts and risks for you or your child?
There are no known risks associated with taking part in this study.

During the testing period we may find that your child may need assistance in other areas of functioning not covered by the current intervention. Should this happen, we will discuss this with you and give a referral for the necessary care. Children may also feel fatigued or irritable during testing as the tasks require concentration. However, children will be given breaks where necessary as well as refreshments. Where necessary, testing can be split over 2 days.

If you wish to discuss the any of the information above, you may ask questions now or call the Principal Investigators listed on the front page of this form.

10. What are the possible benefits to you and your child?
The aim of this rehabilitation program is to implement and evaluate an intervention focused on improving attention. As part of this aim is to investigate the feasibility of this intervention, it is not guaranteed that the attention-training program will result in improved functioning or performance for your child. It is important to bear this in mind at the outset of the study. However, part of the neuropsychological rehabilitation service is to provide you

with useful advice regarding the management of your child in line with his / her areas of strengths and weaknesses.

Through participating in the neuropsychological assessment, you will gain a deeper understanding of the neuropsychological functioning of your child.

11. What are the possible benefits to others?

Should this training program prove to be effective, this will be an important contribution to future neuropsychological rehabilitation services offered to other children who have ADHD. In other words, this research can then be applied to other children, or families of children, who have ADHD. It will also help to motivate the need for formal development of such services in South Africa.

12. If you choose to take part in this research study, will it cost you anything?

Participating in this study will not cost you anything.

13. Will you and your child receive compensation for taking part in this research study?

You will receive R50 per session for both participation and transport. Refreshments will be available at each of the assessments.

14. Can you and your child withdraw from this research study?

You may withdraw your consent and stop participating in this study at any time, without any penalty to you or your child. In addition, refusal to consent to participation in the study will not affect current or future health care.

If you have a complaint or complaints about your rights and welfare as research participants, please contact the Human Research Ethics Committee
Tel: 021 406 6492
E-mail: sumaya.ariefdien@uct.ac.za

15. If you withdraw, can information about you and your child still be used and/or collected?

Information that has already been collected may be used.

16. Once personal and performance information is collected, how will it be kept secret (confidential) in order to protect your privacy?

Information collected will be stored in locked filing cabinets or on computers with security passwords. Only the researcher and supervisors will have access to this information. Your research records will not be released without your permission unless required by law or a court order. However, the researcher is obliged to report situations where your child is apparently at risk of being harmed.

Please note that the sponsors of the study or UCT Ethics Committee members may need to inspect research records.

17. What information about you or your child may be collected, used and shared with others?

The information gathered from you will be demographic information, records of your responses, or your child's performance on the neuropsychological tests, and records of your child's progress in the intervention. If you agree to be in this research study, it is possible that some of the information collected might be copied into a "limited data set" (a computer file) to be used for other research purposes. If so, the limited data set may only include information that does not directly identify you or your child. For example, the limited data set cannot include you or your child's name, address, telephone number, ID number, or any other photographs, numbers, codes, or so forth that link you to the information in the limited data set.

18. How will the researcher(s) benefit from your being in the study?

This study is being conducted as a partial fulfilment for a Masters degree at UCT. In addition, the researcher may choose to present this research at a conference or in a scientific journal.

Signatures

As a representative of this study, I have explained to the participant's (child's) parent the purpose, the procedures, the possible benefits, and the risks of this research study; and how the participant's performance and other data will be collected, used, and shared with others:

_____ _____

Signature of Person Obtaining Consent and Authorization Date

You have been informed about this study's purpose, procedures, possible benefits, and risks; and how your responses and your child's performance and other data will be collected, used and shared with others. You have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time.

You voluntarily agree for you and your child to participate in this study, and for data to be collected from your child's teacher. You hereby authorize the collection, use and sharing of your performance and other data. By signing this form, you are not waiving any of your legal rights.

_____ _____

Signature of Person Consenting and Authorizing Date

Authorization for _____ to participate in the study.

Relationship to child participating in the study: parent / legal guardian

_____

Please indicate below if you would like to be notified of future research projects conducted by our research group:

_____ (initial & surname) Yes, I would like to be added to your research participation pool and be notified of research projects in which I might participate in the future.

Appendix E

Assent Form: ADHD Intervention Group

ASSENT TO PARTICIPATE IN RESEARCH

We would like you to be in our research study because we would like to learn more about children with ADHD and ways to help them.

If you agree to be in this study we will ask you to come to the University of Cape Town (UCT) or to Red Cross Children's Hospital to do some activities with us. For example, we may ask you to try to remember things, to draw or read things.

We will then ask you to come to the University of Cape Town twice a week for 12 weeks to do more activities with us. For example, we may ask you to sort out different colour cards or to press a clicker when you hear certain words on a CD. These exercises and activities will not hurt you, but some of them may be long and you may feel tired at times. If you do, you can tell me and we will stop and take a break at any time.

After the 12 weeks, we will ask you to come one last time to do some different activities with us. Like before, we may ask you to try to remember things, to draw or read things.

Signing this paper means that you want to be in the study. If you do not want to be in the study, do not sign the paper. No one will be cross if you don't sign this paper, and no one will be cross if you change your mind later and want to stop. Everything that happens and what you say when we are together will be a secret between you and me. I will not tell your parents or anyone at school what you say.
You can ask any questions that you have about the study now or anytime later. If you have a question later that you didn't think of now, you can call me on 0834488463 or ask me next time I see you.

Signature of Participant _____ Date _____

Signature of Investigator _____ Date _____

Appendix F

Assent Form: Test-only Group

ASSENT TO PARTICIPATE IN RESEARCH

We would like you to be in our research study because we would like to learn more about children with ADHD and ways to help them.

If you agree to be in this study we will ask you to come to the University of Cape Town (UCT) or to Red Cross Children's hospital to do some activities with us. For example, we may ask you to try to remember things, to draw or read things. These exercises and activities will not hurt you, but some of them may be long and you may feel tired at times. If you do, you can stop and take a break at any time.

After about 12 weeks, we will ask you to come one last time to do some different activities with us. Like before, we may ask you to try to remember things, to draw or read things.

Signing this paper means that you want to be in the study. If you do not want to be in the study, do not sign the paper. No one will be cross if you don't sign this paper, and no one will be cross if you change your mind later and want to stop. Everything that happens and what you say when we are together will be a secret between you and me. I will not tell your parents or anyone at school what you say.
You can ask any questions that you have about the study now or anytime later. If you have a question later that you didn't think of now, you can call me on 0834488463 or ask me next time I see you.

Signature of Participant _____ Date _____

Signature of Investigator _____ Date _____

Appendix G

History Questionnaire

Child's Name: _____ Date of Birth: _____ Age: _____

THE STUDY

- Explain the study, give ethics, consent, assent, participation information sheet.

PARENTS' DETAILS

- Mother/father:
- Age
- Occupation
- HLOE
- Contact details

PREGNANCY AND BIRTH

- Were there any complications during the *pregnancy*?
- Did you take any medicine during pregnancy? Prescribed or over the counter?
- Did you smoke cigarettes while you were pregnant? How many?
- How much did you drink when you were pregnant?
- Anything else, like dagga? Any drugs?
- Was the birth on time? *If early or late, find out why*
- Was it a natural birth or via C-section/Caesarian? Was labor induced?
- Were there any complications during the birth?
- What was your baby's birthweight? _____
- Were there any complications in the *newborn period*?
- And at present, how does s/he eat??
- How does he/she sleep??

DEVELOPMENT

- At what age did your child:
  - sit unaided? (if unsure, check whether it was before 1 year)
  - walk without help (if unsure, check whether it was before 18 months)
  - start babbling/baby talk (if unsure, check whether it was around 6 – 8mths)
  - say their first word? (if unsure, check whether it was around 1 yr)
- Has your child ever been referred to a *Psychologist/Psychiatry* service? Any developmental/neurological/psychiatric problems?
- What school does your child attend? Educated in what language?
- How old was your child in Grade R? What year was that?
- Has your child repeated any Grades?

ADHD

- When was your child diagnosed with ADHD?
- How did it come about that your child was diagnosed?
- Is your child on medication? If so what medication? Dose? How long?
- Has your child been in any other form of treatment for ADHD?
- How are they performing now at school/home/social?

Please feel free to mention anything else you would like to bring to our attention. Any questions?

Appendix H

Letter to teachers

Dear_____

My name is Abigail Wilson and I am currently completing my Masters in Clinical Psychology at the University of Cape Town. I am doing research on different ways to help children who have ADHD. A student in your class, _____, is participating in my research. _____'s parents/caregivers have given me permission to contact you.

Attached you will find:

- A consent form which explains my study and asks you for permission to participate
- Two forms that ask you questions about your student's behaviour at school

I would be most grateful if you would sign the consent form, complete the two forms and send them back to me at your earliest convenience. Either contact me on 0834488463 and I will collect it or my e-mail address is wilson_abigail@hotmail.com.

For participation you will receive R25. I will give the money to _____to give to you. I can also post it to you if you provide me with your address.

Please do not hesitate to contact me should you have any queries or concerns.

Kind regards,

Abigail Wilson
0834488463

Appendix I
Teacher's consent form

Dear Teacher

Informed Consent for you to participate in research and authorization for collection, use, and disclosure of neuropsychological rehabilitation and cognitive performance, and other personal data

You are being asked to take part in a research study. This form provides you with information about the study and seeks your permission for the collection, use and disclosure information necessary for the study. The Principal Investigator (the person in charge of this research) or a representative of the Principal Investigator will also describe this study to you and answer all of your questions. Your s participation is entirely voluntary. Before you decide whether or not to take part, read the information below and ask questions about anything you do not understand. By participating in this study you will not be penalized or lose any benefits to which you would otherwise be entitled. Please note this research has been approved by the Faculty of Science's Human Research Ethics Committee at the University of Cape Town.

1. Title of Research Study

Implementation of an Attention Training Program with Children with Attention Deficit Hyperactivity Disorder in South Africa

2. Principal Investigator(s) and Telephone Number(s)

Leigh Schrieff, Ph.D.	Abigail Wilson (Masters Student)
Department of Psychology	Department of Psychology
University of Cape Town	University of Cape Town
l.e.schrieff@gmail.com	wilson_abigail@hotmail.com
021-650-3708	0834488463

4. Source of Funding or Other Material Support

National Research Foundation and The University of Cape Town's University Research Committee

5. What is the purpose of this research study?

The purpose of this research is to investigate the effectiveness of the Pay Attention! programme in rehabilitating attention in children who have ADHD. This research was undertaken because of a need for such services in South Africa.

6. What will be done if you take part in this research study?

The principle investigator will arrange to meet with you at your school at a time that is convenient for you. You will be required to complete some forms so that we have a better understanding of your student's performance at school, so that we have a holistic understanding of your student's functioning.

Children who have ADHD will be divided into 2 groups and matched to other children with ADHD based on age and gender. These 2 groups will then be allocated to the group that receives the attention training intervention that is being evaluated and a group that will not receive any intervention this year. You will not necessarily know which group your student has been allocated to.

After the intervention, a research assistant will make an appointment with you, and you will be asked to fill out some more forms regarding your student's functioning. Results obtained from these tests will be compared to the first tests.

7. If you choose to participate in this study, how long will you be expected to participate in the research?

You will be required to meet with a researcher twice; once before the intervention commences and again 12 – 14 weeks later. Each session will be up to one hour.

8. How many people are expected to participate in the research?

10 children and their parents/guardians/caregivers/teachers

9. What are the possible discomforts and risks for you?

There are no known risks to you associated with taking part in this study.

Please not that this study will be conducted according to the International Declaration of Helsinki and other applicable international ethical codes for research on human subject.

10. What are the possible benefits to you and your student?

The aim of this rehabilitation program is to implement and evaluate an intervention focused on improving attention. As part of this aim is to investigate how effective this intervention might be, it is not guaranteed that the attention-training program will result in improved functioning or performance for your student. It is important to bear this in mind at the outset of the study. However, part of the neuropsychological rehabilitation service is to provide you, the teacher, with useful advice regarding the classroom management of your student in line with his / her areas of strengths and weaknesses.
By you and your student partaking in the neuropsychological assessment, this will provide you with a deeper understanding of the neuropsychological functioning of your student.

11. What are the possible benefits to others?

Should this training program prove to be effective, this will be an important contribution to future neuropsychological rehabilitation services offered to other children who have ADHD. In other words, this research can then be applied to other children, or families of children, who have ADHD. It will also help to motivate the need for formal development of such services in South Africa.

12. If you choose to take part in this research study, will it cost you anything?

Participating in this study will not cost you anything.

13. Will you and your student receive compensation for taking part in this research study?

You will receive compensation of R25 for each of the assessments.

14. Can you withdraw from this research study?

You may withdraw your consent and stop participating in this research study at any time, without any penalty to you or your student.
In addition, refusal to consent to participation in the study will not affect current or future health care.

If you have a complaint or complaints about your rights and welfare as research participants, please contact the Human Research Ethics Committee

Tel: 021 406 6492
E-mail: sumaya.ariefdien@uct.ac.za

15. If you withdraw, can information about you and your student still be used and/or collected?

Information that has already been collected may be used.

16. Once personal and performance information is collected, how will it be kept secret (confidential) in order to protect your privacy?

Information collected will be stored in locked filing cabinets or on computers with security passwords. Only the researcher and research supervisor will have access to this information. Your research records will not be released without your permission unless required by law or a court order.

However, the researcher is obliged to report cases in which deliberate abuse or neglect is evident.

Please note that sponsors of the study, study monitors or auditors or REC members may need to inspect research records.

17. What information about you or your student may be collected, used and shared with others?

This information gathered from you will be records of your responses with regards to your student's functioning in the classroom. If you agree to be in this research study, it is possible that some of the information collected might be copied into a "limited data set" (a computer file) to be used for other research purposes. If so, the limited data set may only include information that does not directly identify you or your student. For example, the limited data set cannot include you or your student's name, address, telephone number, ID number, or any other photographs, numbers, codes, or so forth that link you to the information in the limited data set.

19. How will the researcher(s) benefit from your being in the study?

The information that you can provide with regards to your student's performance, is helpful in understanding the usefulness and success of the intervention programme under investigation.

This study is being conducted as a partial fulfilment for a Masters degree at the UCT. In addition, the researcher may choose to present this research at a conference or in a scientific journal.

Please note that this research is funded by the National Research Foundation. The researchers and funders declare that there are no financial or non-financial interests, which may inappropriately influence the conduct of this research study.

Signatures

As a representative of this study, I have explained to the participant's (child's) teacher the purpose, the procedures, the possible benefits, and the risks of this research study; and how the participant's performance and other data will be collected, used, and shared with others:

_____ _____

Signature of Person Obtaining Consent and Authorization Date

You have been informed about this study's purpose, procedures, possible benefits, and risks; and how your responses and your child's performance and other data will be collected, used and shared with others. You have received a copy of this form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask other questions at any time.

You voluntarily agree to participate in this study. You hereby authorize the collection, use and sharing of your performance and other data. By signing this form, you are not waiving any of your legal rights.

_____ _____

Signature of Person Consenting and Authorizing Date

Appendix J

Ethical approval from the University of Cape Town's Faculty of Health Sciences

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E52-24 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6338 • **Facsimile** [021] 406 6411
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/research/humanethics/forms

14 May 2014

HREC REF: 234/2014

Dr L Schrieff
Psychology
Humanities Graduate School Building
Upper Campus

Dear Dr Schrieff

PROJECT TITLE: ***IMPLEMENTATION OF AN ATTENTION TRAINING PROGRAM WITH CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER IN SOUTH AFRICA (Student - Ms A Wilson)***

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee for review.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30th May 2015

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/research/humanethics/forms)

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

We acknowledge that the student, Abigail Wilson will also be involved in this study.

Please quote the HREC reference no in all your correspondence.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN ETHICS
Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP) and Declaration of Helsinki guidelines.

Appendix K

Letter to the Western Cape Education Department (WCED)

The University of Cape Town
Department of Psychology
Child Guidance Clinic
Chapel Road
Rosebank
7700

10 March 2014

Dr Wyngaard
Western Cape Education Department
Private Bag 9114
Cape Town
8000

Dear Dr Wyngaard

Research study at EMDC North and Central Schools

I am a Masters student in Clinical Psychology at the University of Cape Town currently undertaking my dissertation. The topic of my thesis is **"Implementation of an Attention Training Program with Children with Attention Deficit Hyperactivity Disorder in South Africa"**.

Attention training is an intervention that forms part of cognitive rehabilitation. The various components of attention training are considered to be skills that can be improved with training and repetitive practice. In the last decade researchers have investigated the effectiveness of attention training as an intervention for ADHD since an individual with ADHD experiences impairment in attention. The results of these studies report that there is an improvement in the cognitive skill being trained directly as well as an improvement in untrained skills, untrained measures of attention and academic efficiency. In addition teachers and parents reported a reduction in observed ADHD symptoms. Despite ADHD being one of the most common neurobehavioural disorders in children, there is little empirical research that has been published on its clinical presentation in Africa. This study will be a randomised control trial to investigate the effectiveness of an attention training programme, Pay Attention! for children between the ages of 6 and 8 years old who have been diagnosed with ADHD in South Africa.

I would like to approach special needs schools in the Cape Town area to recruit potential participants. Participants will be randomly assigned to one of three groups, ADHD intervention group, Art Group and Test-only group. For the purpose of this study only the participants in the ADHD Intervention Group will receive the Pay Attention! Intervention twice a week in 45-minute sessions for a period of 12 weeks. Participants in the Art Group will receive art therapy for the same duration and intensity of the Pay Attention! intervention while the Test-only Group will receive no intervention at all. All three groups will be pre- and post-tested on a battery of attentional measures and should the intervention prove efficacious, the Art Group and the Test-only Group will be offered the Pay Attention!

intervention after completion of this study. Pre- and post-testing will occur within 2 to 4 weeks of beginning and completing the programme.

I will only commence the study once permission has been granted from the WCED. Ethical approval has been granted by the UCT Ethics Committee (Insert ref number when available) and the Faculty of Health Sciences (Insert ref number). I plan to inform parents about the study and provide them with an opportunity for their child to opt out of the study. Participation is voluntary and any learner may discontinue at any time. I will ensure complete confidentiality and anonymity of all parties involved. Following completion of the pre- and post assessments and the intervention and the data analysis, the information will only be available to myself and my research supervisor, Dr Leigh Shrieff who is a lecturer in the Department of Psychology at UCT.

I will make completed copies of the dissertation to your department, as well as to each participating school so that the learners' input and contribution can be acknowledged. However, no personal information (school or learners name) will be included in the dissertation.

I will take care of all administration and logistical arrangements with the school staff and will endeavour to create as little disruption to the school programme as possible.

Thank you for considering my request and please do not hesitate to contact me or Dr Schrieff should you require further information.

I look forward to hear from you.

Kind regards,

Abigail Wilson
M.A Clinical Psychology
Cell: 0834488463
Email: wilson_abigail@hotmail.com

Dr Leigh Schrieff
Research supervisor
Tel: 021-650 3708
Email: l.e.schrieff@gmail.com

Appendix L

Permission to access schools from the Western Cape Education Department

Western Cape Government
Education

Directorate: Research

Audrey.wyngaard2@pgwc.gov.za
tel: +27 021 467 9272
Fax: 0865902282
Private Bag x9114, Cape Town, 8000
wced.wcape.gov.za

REFERENCE: 20140304-25820
ENQUIRIES: Dr A T Wyngaard

Ms Abigail Wilson
C/O The University of Cape Town
Department of Psychology
Child Guidance Clinic
Chapel Road
Rosebank
7700

Dear Ms Abigail Wilson

RESEARCH PROPOSAL: IMPLEMENTATION OF AN ATTENTION TRAINING PROGRAM WITH CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER IN SOUTH AFRICA

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **17 March 2014 till 31 July 2014**
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

    The Director: Research Services
    Western Cape Education Department
    Private Bag X9114
    CAPE TOWN
    8000

We wish you success in your research.

Kind regards.
Signed: Dr Audrey T Wyngaard
Directorate: Research
DATE: 05 March 2014

Appendix M

Qualitative descriptions of WASI IQ scores

Table M1
Qualitative Descriptions of WASI Scores

IQ Scores	Classification
130 and above	Very Superior
120 – 129	Superior
110 – 119	High Average
90 – 109	Average
80 – 89	Low Average
70 – 79	Borderline
69 and below	Extremely Low

Note. Taken from Wechsler Abbreviated Scale of Intelligence (Wechsler, 1999).

Appendix N

Subtests making up composites: Pay Attention! intervention vs. Test-only controls

Table N1

Subtests making up Neuropsychological Composites: Between-group comparisons for Pay Attention! intervention vs. Control Groups pre-intervention (N=10)

	Group						Test statistics		
	Pay Attention! intervention group (*n*=5)			Test-only control group (*n*=5)					
	n	Range	*M (SD)*	*n*	Range	*M (SD)*	*F/H*	*p*	*r*
Basic attention composite (α =0.711)									
Sky search targets	5	3-16	10.20 (5.26)	5	9-14	11.00 (1.87)	0.10	.757	.10
Score	5	4-7	5.60 (1.14)	5	4-15	11.00 (4.12)	7.97	.022	.67
Numbers forward	5	7-12	9.00 (2.35)	5	5-15	10.00 (5.00)	0.16	.696	.13
Selective attention composite (α = 0.979)									
Sky search time/target	5	1-10	6.20 (4.09)	5	1-8	4.20 (3.50)	8.50[a]	.398	.25
Sky search attention score	5	1-12	7.00 (4.42)	5	1-9	4.00 (4.12)	6.50[a]	.190	.33
Verbal memory composite (α = 0.853)									
Word list learning	5	3-12	7.20 (3.49)	5	1-12	7.20 (4.03)	0.00	1.00	.00
Word list delayed recall	5	7-10	8.40 (1.14)	5	4-12	9.20 (3.11)	0.29	0.604	.17
Word list recognition	5	2-13	7.00 (4.34)	5	2-10	6.40 (3.51)	0.05	0.823	.08
Visual memory composite (α = 0.704)									
Dot locations learning	5	5-13	9.60 (2.97)	5	7-10	9.40 (1.34)	0.02	0.894	.04
Dot locations total	5	5-15	11.40 (3.91)	5	8-10	9.60 (0.894)	1.01	0.345	.30
Dot locations long delay recall	5	10-14	11.80 (1.79)	5	5-12	9.80 (2.86)	1.75	0.222	.39

Note. [a]Kruskal Wallis *H*; Sky search time/target, mean rank of the Pay Attention! intervention group = 6.30, and for the Test-only control group = 4.70, for Sky search attention score, mean rank of the Pay Attention! intervention group = 6.70, and for the Test-only control group = 4.30.

Table N2

Subtests making up Neuropsychological Composites: Between-group comparisons for Pay Attention! intervention vs. Control Groups post-intervention (N=10)

	Group						Test statistics		
	Pay Attention! intervention group (*n*=5)			Test-only control group (*n*=5)					
	n	Range	*M (SD)*	*n*	Range	*M (SD)*	*F*	*p*	*r*
Basic attention composite (α =0.850)									
Sky search targets	5	4-16	11.00 (4.58)	5	7-17	10.80 (2.86)	0.01	.936	.03
Score	5	1-9	6.40 (3.29)	5	1-15	10.20 (5.45)	1.78	.219	.39
Numbers forward	5	6-11	9.00 (2.00)	5	4-15	9.20 (4.66)	0.01	.932	.03
Selective attention composite (α = 0.981)									
Sky search time/target	5	2-13	6.20 (4.21)	5	1-13	6.00 (5.10)	0.69	.430	.02
Sky search attention score	5	1-12	6.20 (4.15)	5	1-13	6.20 (5.17)	0.01	.948	.00
Verbal memory composite (α = 0.919)									
Word list learning	5	7-16	11.60 (4.16)	5	3-19	12.00 (6.16)	0.01	.907	.04
Word list delayed recall	5	8-17	13.00 (3.24)	5	5-16	12.60 (4.56)	0.03	.877	.05
Word list recognition	5	5-13	10.60 (3.29)	5	2-13	8.80 (4.21)	0.57	.472	.23
Visual memory composite (α = 0.807)									
Dot locations learning	5	8-15	11.80 (3.11)	5	10-16	12.80 (2.39)	0.33	.584	.18
Dot locations total	5	9-15	11.80 (2.95)	5	10-16	13.60 (2.51)	1.08	.329	.31
Dot locations long delay recall	5	10-14	12.20 (1.48)	5	8-14	11.00 (2.24)	1.00	.347	.30

Appendix O

Between group comparisons: Behavioural Measures Post-intervention for Pay Attention! intervention vs. Test-only controls

Table O1

Between-group Comparisons: Post-intervention BRIEF indices (Parent Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
BRIEF index	*M (SD)*	Range	*M (SD)*	Range	*F*	*p*	*r*
Inhibit	62.60 (11.61)	49-73	66.60 (14.83)	49-82	0.23	.647	.15
Shift	64.40 (13.74)	47-84	57.00 (12.59)	40-71	0.79	.401	.27
Emotional control	62.80 (13.65)	43-73	56.40 (17.16)	36-73	0.43	.532	.20
BRI	64.80 (11.63)	45-75	61.60 (13.61)	42-79	0.16	.700	.13
Initiate	51.80 (18.82)	20-68	58.20 (12.91)	38-74	0.39	.548	.19
Working memory	60.20 (4.81)	55-65	65.80 (10.70)	52-80	1.13	.320	.32
Plan/organise	57.80 (11.88)	46-76	64.60 (16.47)	39-80	0.56	.475	.23
Org. of materials	58.60 (9.84)	46-72	57.40 (11.74)	42-71	0.03	.865	.06
Monitor	57.40 (14.49)	44-82	59.40 (18.06)	31-75	0.04	.852	.06
MI	59.40 (10.06)	50-75	63.60 (16.06)	39-79	0.25	.634	.15
GEC	57.40 (7.44)	50-69	63.80 (14.72)	40-79	0.75	.411	.26

Note. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite; Org = Organisation. The *r* value presented here is an estimate of effect size.

Table O2

Between-group Comparisons: Post-intervention BRIEF indices (Teacher Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
BRIEF index	*M (SD)*	Range	*M (SD)*	Range	*F*	*p*	*r*
Inhibit	55 (11.45)	43-68	65.80 (10.64)	54-78	2.39	.161	.44
Shift	64.20 (12.62)	51-83	55.80 (12.58)	44-74	1.11	.323	.32
Emotional control	57.40 (9.13)	51-73	57.00 (15.94)	43-81	0.00	.962	.02
BRI	58.80 (10.73)	48-76	61.40 (12.07)	48-74	0.13	.728	.11
Initiate	61.80 (9.26)	46-69	62.60 (11.78)	49-75	0.01	.908	.04
Working memory	67.60 (3.13)	63-71	68.80 (8.58)	54-76	0.09	.777	.10
Plan/organise	66.40 (6.19)	57-73	62.60 (13.79)	44-79	0.32	.590	.18
Org. of materials	59.60 (14.01)	44-78	60.40 (12.90)	49-80	0.01	.927	.03
Monitor	63.20 (11.92)	49-76	67.40 (9.61)	58-83	0.38	.557	.20
MI	65.80 (8.41)	54-74	66.00 (10.17)	51-78	0.00	.974	.01
GEC	64.20 (8.73)	52-72	65.20 (11.19)	50-78	0.03	.879	.05

Note. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite; Org = Organisation. The *r* value presented here is an estimate of effect size.

Table O3
Between-group Comparisons: Post-intervention CBCL Syndrome Profiles (Parent Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
CBCL syndrome profile	*M (SD)*	Range	*M (SD)*	Range	*F*	*p*	*r*
Anxious/depressed	62.60 (6.11)	54-69	56.80 (5.07)	50-62	2.67	.141	.46
Withdrawn/depressed	57.60 (7.80)	50-66	56.00 (6.63)	50-66	0.12	.736	.11
Somatic complaints	57.40 (7.64)	50-70	59.80 (6.69)	53-68	0.28	.611	.16
Internalising problems	61.60 (7.89)	50-70	56.60 (10.14)	41-68	0.76	.410	.27
Rule-breaking behaviour	57.60 (7.83)	50-67	58.00 (9.62)	51-74	0.01	.944	.02
Aggressive behaviour	61.20 (5.36)	55-67	60.40 (9.13)	50-68	0.03	.870	.05
Externalising problems	59.60 (7.20)	51-67	59.20 (10.94)	48-72	0.01	.947	.02
Attention problems	58.20 (2.28)	55-61	66.60 (8.85)	53-77	4.23	.074	.54
ADHD problems	60.00 (5.34)	55-69	67.00 (10.07)	53-77	1.89	.207	.40
ODD problems	56.60 (3.91)	52-62	61.00 (9.95)	52-73	0.85	.384	.28

Note. For each comparison presented here, degrees of freedom = (1, 8). The *r* value presented here is an estimate of effect size.

Table O4
Between-group Comparisons: Post-intervention CBCL Syndrome Profiles (Teacher Report) (N=10)

	Group				Test statistics		
	Pay Attention! intervention group (*n*=5)		Test-only control group (*n*=5)				
CBCL syndrome profile	*M (SD)*	Range	*M (SD)*	Range	*F/U*	*p*	*r*
Anxious/depressed	60.00 (6.75)	50-68	58.00 (15.67)	50-86	8.50[a]	.421	.08
Withdrawn/depressed	54.00 (3.00)	50-57	55.20 (7.05)	50-67	0.12	.735	.11
Somatic complaints	54.80 (6.57)	50-62	56.60 (10.85)	50-75	12.50[a]	1.00	.10
Internalising problems	56.00 (10.49)	38-64	54.00 (17.38)	45-85	9.00[a]	.548	.07
Rule-breaking behaviour	55.00 (6.63)	50-66	53.40 (3.78)	50-59	0.22	.652	.15
Aggressive behaviour	56.20 (7.92)	50-70	56.80 (5.26)	51-64	10.00[a]	.690	.04
Externalising problems	54.40 (9.84)	43-70	55.20 (6.02)	48-63	0.02	.881	.05
Attention problems	57.20 (5.93)	50-64	62.20 (9.26)	53-76	1.03	.339	.31
ADHD problems	56.60 (5.03)	51-63	63.40 (6.15)	58-70	3.66	.092	.52
ODD problems	54.80 (8.67)	50-70	55.20 (8.67)	50-70	12.00[a]	1.00	.02

Note. For each comparison presented here, degrees of freedom = (1, 8). The *r* value presented here is an estimate of effect size. [a]Mann-Whitney *U;* for Anxious/Depressed, mean rank of the Pay Attention! intervention group = 6.90, and of the Test-only control group = 4.10, for Somatic Complaints, mean rank of the Pay Attention! intervention group = 5.00, and of the Test-only control group = 6.00, Internalising Problems, mean rank of the Pay Attention! intervention group = 6.30, and of the Test-only control group = 4.70, for Aggressive Behaviour, mean rank of the Pay Attention! intervention group = 5.20, and of the Test-only control group = 5.80, and for ODD Problems mean rank of the Pay Attention! intervention group = 5.20, and of the Test-only control group = 5.80.

Appendix P

Within-group comparisons: Neuropsychological composites and other outcome measures for Pay Attention! intervention vs. Test-only controls

Table P1

Neuropsychological Composites and other outcomes: Within-group Comparisons for Pay Attention! intervention and Test-only control group from pre- to post-intervention (N = 10)

	Pay Attention! intervention group (*n*=5)				Test-only control group (*n*=5)			
	Range	M (*SD)*	*t/W*	*P*	Range	M (*SD)*	*t/W*	*p*
Basic attention								
Pre [a]	-1.26-0.25	-0.30 (0.66)			-0.90-1.35	0.30 (0.39)		
Post [b]	-1.46- 0.52	-0.14 (0.80)	-1.03	.360	-1.38-1.34	0.14 (0.46)	0.79	.476
Selective attention								
Pre [a]	-1.08-1.39	0.30 (1.05)			-1.08-0.78			
Post [b]	-1.05-1.44	0.01 (0.93)	0.10	.376	-1.17-1.55		-0.67[c]	.500
Divided attention								
Pre [a]	1-8				1-10			
Post [b]	1-6		-1.00[c]	.317	1-12		0.00[c]	1.00
Verbal memory								
Pre [a]	-1.06 -1.17	-0.03 (0.87)			-1.70-0.91	0.03 (0.45)		
Post [b]	-1.18-0.96	0.09 (0.83)	-0.79	.475	-1.98-1.07	-0.09 (0.51)	0.44	.686
Visual memory								
Pre [a]	-1.44-1.23	0.25 (1.02)			-0.78-0.18	-0.26 (0.21)		
Post [b]	-1.27-0.74	-0.07 (0.86)	1.10	.333	-0.90-1.28	0.07 (0.42)	-0.63	.563
Working memory								
Pre [a]	6-13	8.80 (2.59)			3-13	9.60 (1.83)		
Post [b]	5-16	10.40 (4.45)	-0.89	.426	6-14	10.60 (1.40)	-0.82	.460
Inhibition								
Pre [a]		8.00 (4.00)				9.40 (3.36)		
Post [b]		10.20 (3.90)	-1.10	.335		7.80 (0.45)	0.92	.382

Note. [a]Pre = Pre-intervention [b]Post =Post intervention [c]Wilcoxin matched-pair signed-rank test.

Appendix Q

Within-group comparisons: Behavioural measures for Pay Attention! intervention vs. Test-only controls

Table Q1

Parent's behavioural assessment (BRIEF): Within-group Comparisons for Pay Attention! intervention and Test-only control group from pre- to post-intervention (N = 10)

	Pay Attention! intervention group (*n*=5)				Test-only control group (*n*=5)			
	Range	M (*SD*)	*t*	*p*	Range	M (*SD*)	*t*	*p*
Inhibit								
Pre [a]	53-78	63.80 (10.62)			57-82	71.40 (11.91)		
Post [b]	49-73	62.60 (11.61)	0.37	.728	49-82	66.60 (14.83)	0.78	.479
Shift								
Pre [a]	64-77	69.40 (5.55)			47-84	64.40 (15.76)		
Post [b]	47-84	64.40 (13.74)	0.83	.453	40-71	57.00 (12.59)	1.22	.288
Emotional control								
Pre [a]	58-71	71.00 (16.93)			51-75	55.40 (16.29)		
Post [b]	43-73	62.80 (13.65)	0.89	.425	36-73	56.40 (17.16)	-0.15	.886
BRI								
Pre [a]	61-78	68.00 (6.63)	0.58	.594	57-83	67.60 (9.63)	1.07	.344
Post [b]	45-75	64.80 (11.63)			42-79	61.60 (13.61)		
Initiate								
Pre [a]	51-75	63.20 (9.34)			50-83	59.60 (12.14)		
Post [b]	20-68	51.80 (18.82)	0.93	.406	38-74	58.20 (12.91)	0.33	.758
Working memory								
Pre [a]	53-73	63.00 (9.14)			58-80	69.80 (10.60)		
Post [b]	55-65	60.20 (4.82)	0.68	.534	52-80	65.80 (10.78)	0.77	.482
Plan/Org								
Pre [a]	44-78	58.00 (13.29)		.	58-82	69.20 (11.08)		
Post [b]	46-76	57.80 (11.88)	0.04	973	39-80	64.60 (16.47)	0.97	.388
Org. of materials								
Pre [a]	52-72	58.80 (7.79)			49-71	61.60 (8.44)		
Post [b]	46-72	58.60 (9.84)	0.06	.952	42-71	57.40 (11.74)	0.94	.399
Monitor								
Pre [a]	50-76	60.40 (11.42)			53-72	60.40 (7.89)		
			0.73	.508			0.13	.903
Post [b]	44-82	57.40 (14.48)			31-75	59.40 (18.06)		
MI								
Pre [a]	52-77	62.00 (10.17)			56-80	68.80 (10.43)		
Post [b]	50-75	59.40 (10.06)	0.63	.561	39-79	63.60 (16.06)	0.82	.458
GEC								
Pre [a]	58-79	65.40 (8.08)			61-83	70.60 (8.79)		
Post [b]	50-69	57.40 (7.44)	1.23	.288	40-79	63.80 (14.72)	1.15	.314

Note. [a]Pre = Pre-intervention [b]Post =Post intervention [c]Wilcoxin matched-pair signed-rank test. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite; Org = Organisation.

Table Q2

Teacher's behavioural assessment (BRIEF): Within-group Comparisons for Pay Attention! intervention and Test-only control group from pre- to post-intervention (N = 10)

	Pay Attention! intervention group (*n*=5)				Test-only control group (*n*=5)			
	Range	M (*SD)*	*t*	*p*	Range	M (*SD)*	*t*	*p*
Inhibit								
Pre [a]	44-78	61.00 (15.13)			52-74	63.00 (8.19)		
Post [b]	43-68	55.00 (11.45)	1.18	.302	54-78	65.80 (10.64)	-0.93	.404
Shift								
Pre [a]	43-105	69.60 (22.84)			42-77	55.80 (15.40)		
Post [b]	51-83	64.20 (12.62)	0.62	.567	44-74	55.80 (12.58)	0.00	1.00
Emotional control								
Pre [a]	54-99	71.00 (16.93)			43-81	55.40 (16.29)		
Post [b]	51-73	57.40 (9.13)	1.50	.208	43-81	57.00 (15.94)	-2.36	.078
BRI								
Pre [a]	54-98	70.60 (16.91)			46-77	59.80 (13.63)		
Post [b]	48-76	58.80 (10.73)	1.56	.194	48-74	61.40 (12.07)	-1.00	.374
Initiate								
Pre [a]	51-75	63.20 (9.34)			44-75	59.60 (12.14)		
Post [b]	46-69	61.80 (9.26)	0.35	.743	49-75	62.60 (11.78	-2.18	.095
Working memory								
Pre [a]	61-81	69.40 (7.40)			49-78	68.20 (11.17)		
Post [b]	63-71	67.60 (3.13)	0.59	.589	54-76	68.80 (8.58)	-0.51	.634
Plan/organise								
Pre [a]	58-85	67.60 (10.29)			38-83	63.60 (18.42)		
Post [b]	57-73	66.40 (6.19)	0.31	.775	44-79	62.60 (13.79)	0.46	.672
Org. of materials								
Pre [a]	47-80	60.60 (12.30)			47-83	62.80 (13.93)		
Post [b]	44-78	59.60 (14.01)	0.43	.686	49-80	60.40 (12.90)	0.97	.388
Monitor								
Pre [a]	49-83	60.80 (13.35)			52-76	65.80 (10.26)		
			-0.59	.588			-0.64	.557
Post [b]	49-76	63.20 (11.92)			58-83	67.40 (9.61)		
MI								
Pre [a]	59-84	66.20 (10.23)			46-82	65.80 (13.57)		
Post [b]	54-74	65.80 (8.41)	0.12	.912	51-78	66.00 (10.17)	-0.13	.902
GEC								
Pre [a]	58-92	69.60 (13.24)			46-82	64.40 (14.22)		
Post [b]	52-72	64.20 (8.73)	0.97	.387	50-78	65.20 (11.19)	-0.52	.629

Note. [a]Pre = Pre-intervention [b]Post =Post intervention [c]Wilcoxin matched-pair signed-rank test. BRI = Behaviour Regulation Index; MI = Metacognition Index; GEC = Global Executive Composite; Org = Organisation.

Table Q3

Teacher's behavioural assessment (CBCL): Within-group Comparisons for Pay Attention! intervention and Test-only control group from pre- to post-intervention (N = 10)

	Pay Attention! intervention group (*n*=5)				Test-only control group (*n*=5)			
	Range	M (*SD*)	*t/W*	*p*	Range	M (*SD*)	*t/W*	*p*
Anxious/ depressed								
Pre [a]	53-73	64.20 (7.85)			51-86		-1.46 [c]	.144
Post [b]	50-68	60.00 (6.74)	1.41	.233	50-86			
Withdrawn/ depressed								
Pre [a]	50-64	56.80 (5.54)			50-67		-1.41 [c]	.157
Post [b]	50-57	54.00 (3.00)	1.63	.178	50-67			
Somatic complaints								
Pre [a]	50-62				50-75	61.20 (9.36)		
Post [b]	50-62		-1.00 [c]	.317	50-75	56.60 (10.85)	1.52	.203
Internalising problems								
Pre [a]	52-70	60.80 (7.53)			45-85	59.20 (15.34)		
Post [b]	38-64	56.00 (10.49)	1.16	.311	45-85	54.00 (17.38)	1.74	.157
Rule-breaking behaviour								
Pre [a]	50-68				50-59	54.20 (4.55)		
Post [b]	50-66		-1.09 [c]	.276	50-59	53.40 (3.78)	1.00	.374
Aggressive behaviour								
Pre [a]	53-69	62.20 (6.53)			50-64	57.80 (5.40)		
Post [b]	50-70	56.20 (7.92)	1.66	.173	51-64	56.80 (5.26)	1.12	.326
Externalising problems								
Pre [a]	53-69	61.20 (6.65)			41-63	55.00 (8.63)		
Post [b]	43-70	54.40 (9.84)	1.46	.218	48-63	55.20 (6.02)	-0.11	.916
Attention problems								
Pre [a]	54-75	62.40 (7.77)			53-76	65.40 (8.38)		
Post [b]	50-64	57.20 (5.93)	1.57	.191	53-76	62.20 (9.26)	1.97	.120
ADHD problems								
Pre [a]	55-87	66.20 (12.28)			56-83	68.00 (9.82)		
Post [b]	51-63	56.60 (5.03)	1.76	.154	58-70	63.40 (6.15)	1.73	.158
ODD problems								
Pre [a]	50-70	61.20 (8.07)			50-70	55.60 (8.29)		
Post [b]	50-70	54.80 (8.67)	1.66	.173	50-70	55.20 (8.67)	0.22	.838

Note. [a]Pre = Pre-intervention [b]Post =Post intervention [c]Wilcoxin matched-pair signed-rank test.