THE EFFECT OF A SEATING WEDGE ON ON-TASK BEHAVIOUR, IN CHILDREN ATTENDING A SCHOOL FOR LEARNERS WITH SPECIAL EDUCATION NEEDS

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the degree of Master of Science in Occupational Therapy.

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DECLARATION

I, Tara-li Wellmann declare that this research report is my own work. It is being submitted for the degree of Master of Science in Occupational Therapy applied to Perceptual Disorders in the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other university.

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ABSTRACT

Introduction

This study investigated the effects of using a seating wedge on attention, posture and on-task behaviour of a sample of 34 children with Attention Deficit Hyperactivity Disorder (ADHD) at a school for learners with special education needs (LSEN school).

Methodology

Using a pre- and post-test research design, the changes in posture, attention and on-task behaviour of the sample were determined before and after the experiment of using a seating wedge on the child's chair in the classroom for a two-week period. Before and after scores for posture (using an adapted Chailey's levels of ability), attention (Using Connors Rating Scales) and on-task behaviour (Using an adapted Daily Behaviour Checklist) were calculated. A comparison of the pre-and post-test scores for these same three variables to the population norms was undertaken. Finally, the association between the changes in posture, attention and on-task behaviour, before and after the intervention was determined.

Results

There were no statistically significant changes in attention, however there were small clinical effects which showed a reduction in hyperactive behaviour. Significant statistical findings in terms of postural changes were discovered, particularly in loadbearing and pelvis positions which improved when the participants made use of the seating wedge. There were also clinically significant improvements indicating the over-all changes in posture when using the seating wedge. In terms of on-task behaviour, statistically significant changes, particularly in internal and external distractibility were identified and clinically significant changes were observed in the majority of the other on-task behaviours indicating that using the seating wedge improves the on-task behaviour in ADHD children at a LSEN school.

Conclusion

It is evident that in all variables, attention, posture and on-task behaviour there were changes in scores which were more in line with population norms when children were positioned on the wedge cushion.

There was a correlation between aspects of attention and aspects of on-task behaviour particularly work speed and learning. A correlation between increased movement and improved attention was identified. The correlation between posture and on-task behaviour revealed no valuable insights and over-all, the posture of the child appears to have no correlation to on-task behaviours.

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"Never let a day pass without looking for the good, feeling the good within you, praising, appreciating, blessing, and being grateful. Make it your life commitment, and you will stand in utter awe of what happens in your life". - Rhonda Byrnes

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NOMENCLATURE

Alternative seating is defined as any adaptive device used to adapt a normal classroom chair or as an alternative to a chair in the classroom. These are usually interventions designed to support a child's sensory needs and may be in the form of a therapy ball, cushion or other various modifications to the chair (Chacko, et al., 2019).

Attention is a foundation skill for the cognitive and neuropsychological functions of learning (Mahone & Schneider, 2012). There are a variety of processes linked to attention, one such process is selective attention, in which sensory responsiveness is inhibited, in order to maintain focus on an important target without becoming distracted (Munks, 2013).This "sensory gating" is a habituation response which allows cognitive processes to occur in an effort to orientate to a specific sensory stimuli, but ignore other stimuli and maintain focus on an intended, more important target also known as shifting attention (Mahone & Schneider, 2012; Munks, 2013). Children with Attention Deficit (Hyperactivity) Disorder often lack the ability to inhibit the incoming sensory input. This results in an immediate orientation and attending to the incoming input resulting in distraction from the intended target (Mahone & Schneider, 2012; Munks, 2013).

Attentional resource: is the amount of attention that is available for any cognitive process to occur and this can be diminished based on how much energy is utilised attending to a task (Blanchet, 2015).

Dynamic seating is any seating solution which provides some movement at the hips or body, while the user remains with the buttocks on the seat, or seating device (Munks, 2013).

Hyperactive behaviour is an inability to keep the body still. These children fidget, climb out of their chair and run around the classroom excessively because they cannot remain seated (Munks, 2013).

Impulsivity is described as an inability to wait ones turn. Children who are impulsive often interrupt other children and cannot wait to be called upon to answer questions in class but often shout out answers (Munks, 2013).

Inattention is considered a failure to attend to details, follow instructions or become easily distracted by external stimuli. Children with inattention also have difficulty organizing their tasks, they lose their belongings and may be forgetful. These children avoid games or activities which require sustained attention (Munks, 2013).

On-task behaviour is defined as: the behaviours which allow a child to be engaged in teacher assigned activity. These may include listening to instructions, asking for help appropriately, engaging in the task set out, and remaining in the proper location on the task (such as at the desk) (Adams & Kumar, 2019).

Posture is defined as the position of the body parts in relation to one another and their position in space. Each body segment should be aligned symmetrically in order to achieve adequate posture (Poutney, et al., 1999).

Postural control is considered “the process of regaining or maintaining stability in a position” (Reiley, et al., 2008), page 2.

ABBREVIATIONS

ADHD	Attention Deficit Hyperactivity Disorder
LSEN	Learners with Special Education Needs
SIAS	National Strategy on Screening, Identification, Assessment and Support
CNS	Central Nervous System
DSM-V	Diagnostic and Statistical Manual of Mental Disorders-5th Edition
SPD	Sensory Processing Disorder
ASD	Autism Spectrum Disorder

CHAPTER ONE: INTRODUCTION

1.1. GENERAL INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is a developmental disorder that results in hyperactivity, inattention and a lack of self-control (Mahone & Schneider, 2012). These children experience challenges with attention and on-task behaviour (Buckle, et al., 2011). Functional implications of this disorder include deficits in motor, academic, social and emotional functioning (Shorer, et al., 2012). When involved in prolonged classroom activities, these children display fidgety behaviour, are often restless and have difficulty maintaining attention (Mahar, et al., 2006).

Shorer et al.,(2012) proposed that children with ADHD demonstrate cerebellar and vestibular deficits with delays in correcting posture and thus exhibit poor postural control (Shorer, et al., 2012). Postural control is the ability to maintain and adjust posture in the classroom, usually in a seated position, while performing other tasks, such as reaching for an object (Westcott, et al., 1997). Studies by Beauchet et al.,(2017) reported that postural control requires attentional resources, specifically focus during an attention demanding task such as counting backwards and memory related tasks: (Beauchet, et al., 2017). Postural sway increased in children between eight and nine years when performing a cognitive task which utilised their attentional resources (Reiley, et al., 2008). The somatosensory systems are the primary systems involved in maintaining postural control (Westcott, et al., 1997). These include the vestibular system, proprioceptive system as well as the tactile and visual system. Dynamic systems theory concludes that all these systems work together to produce an appropriate behavioural response. Thus, the sensory system provides the child with a sensory cue for an appropriate motor response from the biomechanical system (Westcott, et al., 1997).

Additional sensory input such as an alternative seating device can increase the sensory input provided to a child over and above that which may be gained from a standard classroom chair (Umeda & Deitz, 2011). A popular alternative seating device is the therapy ball; the therapy ball provides the child with the proprioception and vestibular input required for good posture (Bagatell, et al., 2010). However, therapy cushions such as the seating wedge have been reported as a more convenient alternative to therapy balls as they can be placed on the classroom chair and take up

much less space than therapy balls (Umeda & Deitz, 2011). The seating wedge, which is filled with air, allows for more movement than a standard classroom chair (Gains, 2012).

Children diagnosed with ADHD are at risk for academic failure and may require special education (Mahone & Schneider, 2012). Special education may be in the form of inclusive education, where special learning needs are met through additional support by teachers or implementation of supportive devices (Sonday, et al., 2012). The schools which provide this support are known as a “Learners with Special Education Needs” schools or LSEN schools (Pillay & Terlizzi, 2009). Learners in such a school may also receive occupational therapy. In order to increase the attention and on-task behaviour of these children, an occupational therapist may work collaboratively with the teacher to attempt to decrease the attentional demands on the child.

The use of dynamic seating in a classroom environment is one such strategy which is reported to be beneficial in improving a child’s on-task behaviour through better attention and focus on the task. The dynamic seating system provides the child with proprioceptive and vestibular input which assists with improved balance, posture and attention (Pfeiffer, et al., 2008). This can be done through using a seating wedge to increase the sensory cues provided to the child, for stimulation of better posture (Umeda & Deitz, 2011).

The seating wedge is one example of dynamic seating used clinically in paediatric occupational therapy practice currently. However, there is little conclusive evidence to support its efficacy.

1.2. STATEMENT OF THE PROBLEM

There is little research describing the effects of dynamic seating and its impact on on-task behaviour in children with ADHD (Pfeiffer, et al., 2008).Current anecdotal evidence has reported that the seating wedge has a positive influence on the behaviour of children in the classroom. The research identified few studies involving a seating wedge were found and while this study reported the seating wedge to be useful. it only had a sample of two participants which the researchers considered a limitation and recommended that future studies include a larger sample size (Umeda & Deitz, 2011).

The need for evidence-based approaches, particularly in the school environment, has been identified by the scientific community as cited by Schoen, et al. (Schoen, et al., 2008), It is also an area of concern reported by Dr.Jonathan Broomberg, the chief executive officer of a well-known medical aid scheme in South Africa, through comments made in public forums (Broomberg, 2016).

1.3. THE PURPOSE OF THE STUDY

Teachers in LSEN Schools are being progressively placed under mounting pressure to aid learners in achieving adequate academic results. However, children such as those with ADHD who have limited capacity to adequately attend to on-task activities as a result of poor postural control and attention, will continue to find seated school-based tasks difficult without appropriate intervention (Pfeiffer, et al., 2008; Kratenova, et al., 2007).

Healthcare professionals are increasingly prescribing medication for children to address symptoms of ADHD such as inattention, restless and fidgety behaviour (Mahone & Schneider, 2012). Alternative methods of intervention should be considered first as the psychotropic drugs which are commonly used display side effects in children. These include Central Nervous System (CNS) effects such as dizziness, lethargy and headaches. They also result in gastrointestinal effects such as nausea and vomiting (Demopoulos, 2010).

Alternative seating such as therapy balls, air cushions and seating wedges have been reported to assist with attention in children with a variety of disorders, however these studies are limited (Pfeiffer, et al., 2008). If a simple non-invasive strategy such as a seating wedge could be implemented into the classroom and improved the on-task behaviour of children, it may enhance classroom participation and academic achievement in children with ADHD and lessen the need for psychotropic drug prescription.

This study was designed with the intention to expand upon the limited research which was available on the effectiveness of using seating wedges to improve on-task behaviour in children with postural control and attention difficulties and assist in answering the research question “Does using a seating wedge improve on-task behaviour in children with postural and attention difficulties?”. Aspects of the studies by (Pfeiffer, et al., 2008) and (Demopoulos, 2010) were used to shape the study.

1.4. THE AIM OF THE STUDY

The aim of this study was to determine the effect of using a seating wedge during in-seat tasks in the classroom, on the on-task behaviour of children with poor postural control and attention difficulties attending a LSEN school.

1.5. OBJECTIVES

Three objectives guided this study:

- To determine the change on posture, attention and on-task behaviour when using a seating wedge with children in the classroom at an LSEN school.
- To compare the pre- and post-test scores for posture, attention and on-task behaviour to population norms when using a seating wedge in the classroom, in children at a LSEN school.
- To determine the association between the changes in posture, attention and on-task behaviour before and after intervention using a seating wedge in the classroom in children at a LSEN school.

1.6. NUL HYPOTHESIS

Using a seating wedge does not influence on-task behaviour in children with attention and postural deficits, at a LSEN school.

1.7. JUSTIFICATION FOR THE STUDY

Occupational therapists provide a valuable professional contribution to the education process through their unique insights into children's academic performance and are becoming a more integral part of the school environment in South Africa. Not only do occupational therapists provide therapy for children with special needs and disabilities, but they also play a role in providing educator training and implementation of special equipment or techniques in the classroom This aids children with low level learning difficulties within mainstream learning environments (Sonday, et al., 2012).

The optimal 90-90-90 seating is difficult for children with postural control and attention problems to maintain over time and results in fatigued and a "slumped" posture (Neville, 2005). Postural control requires attention over time and studies have shown that children who lack adequate attention have difficulty maintaining postural control (Shorer, et al., 2012; Reiley, et al., 2008). A child will develop good or bad postural habits between the ages of six and 12 years and these habits, become lifelong and so

ensuring that these habits are positive will prevent musculoskeletal pain and deformity developing in later years (Valenciano, et al., 2020). The use of a seating wedge may allow the child to remain in an optimal position in that it provides an anterior pelvic tilt for adequate stability, without the need to actively attend to the postural requirements. Thus, having more attentional resources to remain on-task (Shorer, et al., 2012). There are a number of therapeutic strategies which can be incorporated into the classroom environment to aid children with poor attention and ability to focus. One such strategy is the implementation of dynamic seating such as the seating wedge. It is reported that these air-filled seating systems allow the child to be positioned with improved posture. This allows more attentional resources are available, thereby improving on-task behaviour or classroom performance (Umeda & Deitz, 2011; Bagatell, et al., 2010; Chacko, et al., 2019; Fedewa & Erwin, 2011; Pfeiffer, et al., 2008; Neville, 2005). There are a limited number of older research studies in the available literature and more recent works would be beneficial.

The research report has been organised into the following Chapters. Chapter Two of the research report will outline the current literature and research related to learners with special educational needs, the academic support within the classroom, attention and posture in children as well as the interventions used for children with ADHD as a supportive argument for this study. Chapter Three will outline the methodology used and Chapter Four will report on the results of the study. The results will then be analysed, discussed and compared to the current literature in Chapter Five to answer the research question. Concluding remarks and recommendations will be made in Chapter 6.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This literature review discusses policies around inclusive education and the role of occupational therapists in LSEN schools. It describes the current classroom expectations for children in a grade one class and how this compares to expectations for learners with special education needs. It also defines attention deficit (hyperactivity) disorder (ADHD) and the impact such a diagnosis has on occupational performance in the classroom. The current treatment protocols, as well as long term consequences of a lack of intervention for children with ADHD will be discussed. The literature review will highlight the impact of posture on attention and how these factors influence on on-task behaviour. Lastly the use of a seating wedge will be described as a therapeutic adaptation to improve on-task behaviour in the classroom.

Literature for this study was sourced from the following data bases ERIC, EBSCO Host, PubMed, Scopus and Google Scholar using the search terms “inclusive and special needs education’ AND “attention deficit (hyperactivity) disorder (ADHD)” AND “postural control AND attention” AND “on task behaviour” AND “seating -disc or wedge” from the years of 2006-2021. Seminal articles outside of this time period were also included and both national and international articles were utilised. The abstracts of each article were reviewed and if relevant, the full article was then read and reviewed. The reference list of relevant articles was also reviewed for additional information.

2.2 INCLUSIVE EDUCATION

The White Paper 6 of the National Department of Basic Education, which ensured that all South African learners’ fundamental right to non-discriminative, basic education was implemented in 2001. White Paper 6 focused on including learners with deficits/disabilities in mainstream schools, rather than segregating them according to their disabilities (Department of Basic Education, 2001). This policy emphasises providing of educational and other support for such learners according to intensity of

the support which they required to provide for their educational needs. The policy recognises that all children have the capacity for learning, although some children have different learning needs. This policy also provides the principles to enable the relevant educational structures and resources to meet the needs of all learners in order to facilitate their participation in education (Department of Basic Education, 2001)

The White paper 6 also emphasises that if learning needs are not met within the classroom environment, then it can be deduced that these children are being excluded from actively participating in effective learning (Department of Basic Education, 2001). Learners have a variety of learning needs and these are based on a number of different factors which may include physical, mental, sensory, neurological, intellectual capabilities as well as past experience or deprivation (Lombard, 2007). These learning difficulties may not only have a medical cause but may also stem from other aspects affecting development such as exposure to trauma, deprivation or neglect, thus these barriers to learning may actually be external in nature due to factors in the environment and not necessarily internal to the child (Lombard, 2007).

Currently mainstream schools require learners “to fit into” the system which is already in place. Inclusive education would require a mutual understanding and respect of differences, where strategies were implemented in order for all learners to be supported and accommodated. This would mean overcoming the barriers to learning which these children face through adapting the classroom environment. Currently, learners with internal barriers to learning are sent away from mainstream schools if they “cannot fit in” and the idealised principle of inclusive education with a single education structure which accommodates all learners has not been implemented (Pillay & Terlizzi, 2009).

In order for an inclusive system to be effective, educators require guidelines for inclusive education. To enable curriculum differentiation, the Department of Basic Education published the National Strategy on Screening, Identification, Assessment and Support (SIAS) which allows for the different levels of support needed by learners. Learners with low support needs and requiring short-term interventions can be accommodated within mainstream classrooms which are geared to meet some variation in educational needs. However, when a learner has moderate support needs, adapted instructional strategies and teaching support materials may be required in a

specialised classroom. A district-based support team of therapists or therapists in private practice based at a school may facilitate and monitor the support and adaptations for these learners (Department of Basic Education, 2014).

Occupational therapists have been considered vital members district-based support team to facilitate the implementation of the inclusive education policies in South Africa since the acceptance of White paper 6 in 2001 (Department of Basic Education, 2001). Occupational therapists played a pivotal role in the writing of the policy and guidelines due to their ability to identify learning needs and also detail how their expertise could be used in facilitating learning within the classroom environment (Pillay & Terlizzi, 2009). Optimizing occupational therapy expertise in these environments through increasing posts for therapists in mainstream environments would allow for increasing support systems for children with educational support needs in mainstream schools (Henderson & Pehoski, 2006; Makhalemele & Tlale, 2020).

Currently in South Africa there are limited human and financial resources required to implement additional support services in mainstream schools. The current school fee structure in schools results in insufficient funding to support these extra educational support requirements. In some cases, parents are able to take their children to private occupational therapists for support, however this does not address the difficulties within the classroom. In some schools there is the opportunity for occupational therapy to be provided through an arrangement with a private practitioner at the school which allows for better teacher-therapist interaction, although in these cases it is not always possible to change classroom environments (Pillay & Terlizzi, 2009).

Thus, while the policy exists, mainstream schools are not yet considered to be fully “inclusive” thus, children who are not meeting academic expectations in the mainstream environment, who do not have the available financial resources for private occupational therapy, benefit tremendously by being included in a LSEN school (Lombard, 2007).

2.2.1 LEARNERS WITH SPECIAL EDUCATION NEED SCHOOLS

For those learners who require high or frequent and specific educational support specialised or LSEN schools are available to provide support materials, facilities and personnel (Department of Basic Education, 2001). These LSEN schools provide

support in terms of assessment and intervention as well as adaptations or adjustments that need to be made to the curriculum and within the classroom setting to enable learning (Pillay & Terlizzi, 2009). These are full service schools, which may follow the mainstream curriculum, but provide a holistic learning experience for children who have additional learning needs (Sonday, et al., 2012).

Many children who have difficulties with learning, may experience secondary psychological difficulties such as withdrawal due to low self-esteem, poor motivation and dependency on others (Pillay & Terlizzi, 2009). Typically, a child's behaviour results from the interaction between the child as an individual and the environmental context in which he finds himself (Pillay & Terlizzi, 2009). Thus, if the environment provides continuous negative feedback the child will respond accordingly. Studies show that these children with learning difficulties, may be at risk of early drop out from school and have potential for destructive behaviour due to their learning delay and poor academic performance and progression (Pillay & Terlizzi, 2009; Sonday, et al., 2012; Lola, et al., 2019).

The LSEN school environment aims to positively impact on the child's behaviour and academic success because the school provides the environmental fit and expectations consistent with the child's individual abilities through the addition of support and assistance. The teachers at LSEN schools use different educational approaches with these children to support them. This includes adapting the curriculum, allowing for additional time, individualized attention and adapting the environment to suit the children's needs (Pillay & Terlizzi, 2009). The LSEN schools also offer a variety of other therapeutic services, not only teaching (Department of Basic Education, 2001). These schools have onsite therapists including speech therapists, occupational therapists and psychologists. In South Africa most government based LSEN schools are subsidized, meaning parents do not pay additionally for the therapies provided. These additional support strategies can improve the psychological development of these children including improved motivation and independence to learning so as to prevent these children from lagging behind their peers (Pillay & Terlizzi, 2009). Children who lag behind their peers in academic achievement have been reported to have difficulty in performance after school, such as post school education or employment opportunity.

The inclusion strategies described above which are implemented in the LSEN school environment go a long way in ensuring that schooling is a positive experience which is enjoyed (Van Niekerk, 2007; Sonday, et al., 2012) It is through the collaboration of the therapists and other professionals with expertise in this area, with teachers, to create this inclusive environment and ensure the holistic needs of all learners is met (Pillay & Terlizzi, 2009; Sonday, et al., 2012).

2.3 ATTENTION DEFICIT HYPERACTIVITY DISORDER

Children with high support needs due to internal barriers to learning may be diagnosed with ADHD which has well described comorbid learning difficulties. Early identification of these characteristics has been shown to correlate with diagnosis of academic deficits later on in life. Children who were identified as having inattentive behaviours early in development, were later on diagnosed with reading, spelling or mathematics' difficulties (Mahone & Schneider, 2012).

Attention Deficit Hyperactivity Disorder is a neurodevelopmental disorder which is classified by inattention, impulsivity and hyperactivity (Schilling, et al., 2003; Munks, 2013). Children with ADHD present with associated motor deficits such as clumsy behaviour as well as poor gross and fine motor skills in conjunction with poor attention and focus (Beurskens & Bock, 2012; Manicolo, et al., 2017; Yogev, et al., 2008; Fliers, et al., 2008). Studies show that motor impairments in children with ADHD include deficits in timing, coordination and force. It has been suggested that impairment of these functions, including balance, are associated with cerebellar impairments (Aydinli, et al., 2018; Gowen & Miall, 2007; Shum & Pang, 2009) or atrophy (Shorer, et al., 2012). The decreased uptake of dopamine in the basal ganglia also leads to dopamine depletion which plays a vital role in balance. The subsequent decreased activation of these areas, results in poor postural corrections which is required for postural control, thus influencing the posture of these children (Shorer, et al., 2012).

Poor attention and inability to focus influence executive functioning skills, difficulties with executive functions such as self-restraint. This is due to an inability to make use of cognitive maintenance of attention on a specific target which is commonly evident in the child with ADHD. This results in immediately responding to input presented in the environment without considering factors such as context or social expectation (Mahone & Schneider, 2012). Thus, these children are often described as loud, "on-

the-go" children (Munks, 2013). Children with poor sensory modulation are also often described as "on-the go" and it is reported that "sensory modulation may be a factor in children who demonstrate attention deficits" (Schilling, et al., 2003) p535. These children may require additional movement input and a gentle rocking motion, such as that provided by being seated on therapy balls, to calm the system and regulate the arousal levels (Schilling, et al., 2003).

2.3.1 Prevalence and factors associated with attention deficit hyperactivity disorder

In South Africa ADHD is prevalent in about 5% of children and adolescents and 2.5% of the adult population (Vogel, 2014). Diagnosis is frequently made in school aged children, with the symptoms usually presenting in early childhood and in some cases persisting into adulthood (Lola, et al., 2019).

As the behaviour of pre-school children is often characterized by high activity levels, poor concentration and impulsivity, especially prior to four years of age, it may not always be easy to identify the child with ADHD (Harpin, 2005; Mahone & Schneider, 2012). It is during the primary school years however, when the differences in behaviour are compared to other children, that the symptoms begin to present themselves more clearly (Harpin, 2005). According to the Diagnostic and Statistical Manual of Mental Disorders-5th Edition (DSM-V) , the child should present with a pattern of either inattention and/or hyperactivity and impulsivity which causes deficits in occupational performance in areas of social, educational and work settings for six months or longer in order to be diagnosed with ADHD (American Psychiatric Association, 2013). The class teacher is the person who spends most of their time with the child and it is thus, the teacher who is usually the person to initially refer the child for diagnosis (Topkin & Roman, 2015).

Sensory Processing Disorder (SPD) is prevalent among children with ADHD however, unlike Autism Spectrum Disorder (ASD) (which requires sensory processing difficulties to be present in order to be diagnosed according to the DSM-V) children with ADHD do not need to have sensory processing difficulties in order to be diagnosed. Children with ADHD do however present with deficits which may appear similar to those of SPD. This may be due to the fact that adequate attention is required for satisfactory sensory processing. It stands to reason then, that children with ADHD (where attention is

dysfunctional) would then have deficits in sensory processing. However, further research into the neural basis of SPD is required in order to make conclusive assumptions around these attentional processes especially considering that ADHD has been clearly confirmed through imaging showing definite brain structure abnormality, while no such information is available for SPD (Crasta, et al., 2020; Koziol, 2012). In addition, a study by (Ahn, et al ., 2004) suggested that ADHD and SPD are separate neurodevelopmental disorders as 30% of participants had symptoms of only SPD or ADHD. In two separate studies it was determined that children with ADHD often present with SPD, however the pattern of these disorders is unknown (Delgado-Lobete, et al., 2020) (Engel-Yeger & Ziv-On, 2011) and it was determined that one should consider the sensory processing of the child with ADHD when implementing intervention.

Attention Deficit Hyperactivity Disorder is diagnosed more regularly in male children than female children (Munks, 2013) , with the male to female ratio of about 4:1 in South Africa (Vogel, 2014). By the age of four, girls are reported to already show less impulsivity and aggressive behaviour compared to boys (Munks, 2013). Early development of the female cortex results in better early manifestation of neurobiological, cognitive, motor and social skills as compared to male children who demonstrate a later development of these skills (Mahone & Schneider, 2012). Thus, girls with ADHD may present differently to boys resulting in mis- or under-diagnosis of the condition in girls (Vogel, 2014).

It has been determined that ADHD is a result of a combination of genetic, environmental and developmental factors. In 80% of cases there is an underlying genetic factor which contributes to its prevalence. However, there have also been links reported to variables such as the education, occupation and socio-economic status of the family, where poor education and socio-economic status have been found to be higher risk factors. Smoking and drinking habits of the mother as well as caesarean delivery have been reported to also be risk factors for ADHD which may be associated with late starting of school due to learning difficulties (Lola, et al., 2019).

Due to genetic influences, parental factors have been reported to contribute to the difficulties children with ADHD experience. Since the majority of parents of these children present with many of the same symptoms, this may impact on the parent’s

ability to adequately parent the child. The parents may not be able to teach the child appropriate strategies to cope socially, as well as academically (Mikami, et al., 2010). This is believed to be further compounded by the fact that parents often have a poor understanding of their child's diagnosis. Studies have reported that parents don't always understand the reasons for their children's behaviour (Ahmed, et al., 2014; Ringer, et al., 2020). Research has also shown that parents have differing views and perceptions on their children's behaviour as well as the extent to whether it would be considered "normal", disruptive or whether it should even have a clinical diagnosis. These perceptions were found to be dependent on the social and cultural background of the parent (Beliard, et al., 2019; Bergey, et al., 2018; Singh, 2011; Hinshaw & Scheffler, 2015). In order for effective diagnosis and intervention, professionals rely on the reports by parents and teachers in terms of the child's behaviour in a variety of settings (Mahone & Schneider, 2012). However, parents may not always have the best understanding of the disorder and so their concerns and reports should always be further evaluated through standardised information such as the Connors Rating Scale which can be compared to the opinions of other professionals working with the family.

2.3.2 Treatment of attention deficit hyperactivity disorder

Treatment for ADHD comprises primarily of pharmacological intervention as well as psychosocial interventions. It is recommended that children with mild ADHD or who are under the age of five years, first have psychosocial intervention before pharmacological action is considered (Vogel, 2014). According to Singh (2011), "There is little attention to ADHD as a lived experience in local contexts, or consideration of how interactions between individual biology and particular environmental inputs might give shape and meaning to symptomatic behaviours and to the success of intervention" (Singh, 2011):p979-980. Recommendations regarding the sensory processing of the child when planning intervention has also been suggested and this is not considered if only pharmacological intervention is implemented (Engel-Yeger & Ziv-On, 2011).

Although psychosocial and behavioural therapies are recommended as the initial treatment for children under five years with ADHD, in South Africa it is much more common for medication to be prescribed before intervening with other therapeutic methods (Ahmed, et al., 2014). In 80% of cases the pharmacologic intervention is

considered effective in reducing some symptoms and promoting better attention, however, medication is not able to change learned behaviours which may have developed as a result of poor attention and focus (Ahmed, et al., 2014). Stimulant and non-stimulant medication is prescribed in order to treat ADHD symptoms. Stimulant treatments increase the availability of catecholamine's (dopamine and norepinephrine) in the synaptic cleft of the fronto-striata circuits which then improves attentional functions (Mahone & Schneider, 2012). The most commonly used stimulant medication is methylphenidate which can be prepared in a number of ways to allow for immediate, short acting results or slower release, longer acting results (Vogel, 2014). Despite improvements in ADHD symptoms such as improved attention and focus and reduced distractibility, longitudinal studies by Jensen et. al, 2007 and MTA cooperative group 1999 as cited by Meerman et.al (2017) described that between seven and 12 years, these improvements are levelled out and no longer comparable, showing that the long-term benefits of medication are not superior to behavioural and psychosocial intervention (Meerman, et al., 2017). More effective means, with less side effects to improving attention should be considered in the child with ADHD. In order to find a way to improve ADHD symptoms without medication or with lowered medication. Thus, research into the use of the seating wedge to determine whether the seated wedge may assist with improved posture and attention and thus improved-on task behaviour is hoped to justify its use more often with children with ADHD to improve their symptoms.

Table 2.1 The variety of medication used to treat Attention Deficit Hyperactivity Disorder as well as the side effects thereof.

Medication	Pharmacological name	Side effects
Methylphenidate: (Challman and Lipsky, 2000)	Ritalin Concerta Conramyl Neucon	**Cardiovascular:** hypertension, tachycardia, angina, dysrhythmias **Central nervous system**: Insomnia, nervousness, headache, dizziness, dyskinesia **Gastrointestinal:** Anorexia, nausea, abdominal pain, weight loss. **Dermatologic**: Rash, urticarial
Atomoxetine: (Garnock-Jones and Keating, 2009)	Strattera	**Cardiovascular:** moderate to severe hypertension, atrial fibrillation, atrial flutter, ventricular tachycardia, ventricular fibrillation, ventricular flutter, advanced arteriosclerosis, narrow angle glaucoma, hypertension, tachycardia, angina, dysrhythmias **Central nervous system:** Insomnia, nervousness, headache, dizziness, dyskinesia, fatigue, depression, mood swings, suicidal ideation **Gastrointestinal:** Anorexia, nausea, abdominal pain, weight loss. Xerostomia, vomiting, constipation increased blood bilirubin **Dermatologic:** dermatitis
Risperidone (Filho et al., 2005)	Risperlet Risnia Zoxadon	**Central nervous system:** Insomnia, nervousness, headache, dizziness, dyskinesia, fatigue, fever, headache **Gastrointestinal:** weight gain nausea, abdominal pain, vomiting, constipation, sore throat **Dermatologic**: dermatitis, dry mouth, skin rash

Non-stimulant medication, specifically Atomoxetine is a selective noradrenaline reuptake inhibitor which increases the dopamine levels in the synaptic cleft through a secondary response (Vogel, 2014). This medication is slower acting and requires longer administration to ensure adequate blood levels of the medication. This is usually prescribed should the child not respond to or experience severe side effects of stimulant medication (Ahmed, et al., 2014). In the event that alternative medication such as Amoxetine is ineffective, Clonidine, an alpha-2 agonist which is also shown to improve ADHD symptoms and may be used (Vogel, 2014). Risperidone is an anti-

psychotic which has been shown to reduce ADHD symptoms (Filho, et al., 2005) which has also been prescribed when the above mentioned drugs are not effective. There is research that indicates that the efficacy of Risperidone is equal to that of Methylphenidate (Biederman, et al., 2008).

All these medications have a number of concerning side effects (Table 2.1) which may be monitored or treated with other drugs (Vogel, 2014). These side effects include growth delay, insomnia, cardiac and blood pressure effects as well as jaundice and suicidal ideation. Pharmacological intervention should not be considered a long-term option for many children as after seven to eight years of age, longitudinal studies have shown a levelling off of drug efficacy (Vogel, 2014; Meerman, et al., 2017).

According to Meerman (2017), pharmacological intervention may assist with treating the primary deficits such as attention deficit, however behavioural impacts still require behavioural therapy in order for long term improvements to be noted (Meerman, et al., 2017). This means that careful consideration needs to be given to all interventions. Side effects of medications treating ADHD such as nervousness, insomnia, aggression, restlessness and anxiety have also been correlated to sensory processing disorder (Munks, 2013) and it is recommended to have both pharmacological and psychosocial interventions for optimal treatment of ADHD (Vogel, 2014; Meerman, et al., 2017).

2.4 IMPACT OF ATTENTION DEFICIT HYPERACTIVITY DISORDER IN THE CLASSROOM

The classroom environment is usually one which challenges the child with ADHD. The structured classroom environment with expectations related to behaviour and academic achievement is one in which learners with ADHD find it difficult to perform. Children with ADHD usually have normal to above average intellectual functioning; however, they still have difficulty in applying their intellect to the academic environment or to everyday situations (Perold, et al., 2010). They often demonstrate fidgeting and distractibility which results in poor on-task behaviour as they get up and often move around the classroom, unable to adequately focus on the requirements of the learning activity. This can be distracting to other children in the classroom as well as the teacher, who may often respond negatively with a punishment.

2.4.1 Effect of posture and attention

The lack of adequate ergonomics in the classroom as a result of poorly designed chairs and a lack of sufficient movement, sometimes for up to five hours a day, may result in poor posture. This can impact on on-task behaviour through increased fidgeting (Schilling, et al., 2003). Movement seeking is observed in children with ADHD especially if they present with characteristics of hyperactivity. This results in an inability to remain seated which impacts on on-task behaviour (Schilling, et al., 2003; Kratenova, et al., 2007; Bagatell, et al., 2010; Umeda & Deitz, 2011).

Poor posture as well as fidgeting and hyperactivity in children with ADHD is reported to result from deficits in vestibular or somatosensory processing (Chacko, et al., 2019). These deficits lead to poor integration of sensory information and may result in poor posture due to an inability to adapt to environmental changes (Aranha, 2006) . If a child has poor posture, it can affect their performance in formal schooling, due to the increased time spent in sitting positions and the poor ergonomics of classroom furniture (Kratenova, et al., 2007). Research indicates that primary school children who have poor sitting posture in the classroom tend to perform poorly, academically (Immekus, et al., 2019).

Postural control in the classroom context is required to maintain stability and upright posture within different positions, such as sitting for extended periods (Reiley, et al., 2008). The attentional resources needed for adequate posture are dependent on the complexity of the postural position. The attentional resources are less if the base of support is wide or there is more external support and if the academic task the child is engaging in is simple (Shorer, et al., 2012). It is believed that while maintaining less complex postural positions such as sitting, there is an automaticity of balance which is “reflexive” in nature which is an essential motor skill, thus less attentional resources are required to maintain these positions (Shorer, et al., 2012). Maintenance of posture such as sitting is less demanding and should be reflexive and automatic when the cognitive processing resources are limited, such as during an attention demanding activity (Shorer, et al., 2012). This reflexive action has been found to be problematic in children with ADHD since they have been found to present with increased body sway, poor fixation capability and poor postural stability when compared to typical children (Caldani, et al., 2019). It has, therefore, been suggested that in children with

ADHD where a delay in the acquisition of the correct posture has been identified, that they need to pay attention to their posture to correct it. In the child with ADHD, even if they assume a simple sitting posture, they may be using additional attentional resources which can then interfere with executive processing such as working memory which is required for adequate academic skills (Beauchet, et al., 2017). This indicates that children with ADHD may benefit from an adaptation which could assist in maintaining posture without requiring them to utilise additional attentional resources which could then positively impact on their academic performance.

Poor posture in children with ADHD may result from deficits in vestibular or somatosensory processing (Pfeiffer, et al., 2008). These children may appear fidgety, swing in their chairs, or get up and walk around in order to gain additional vestibular input, thus affecting their ability to remain on task (Pfeiffer, et al., 2008). This movement may also be related to autonomic under-arousal identified in children with ADHD which means that they are not able to effectively modulate their arousal systems (Pfeiffer, et al., 2008). There is conclusive evidence which indicates that children with ADHD demonstrate increased fidgety behaviours and poor concentration (Schilling, et al., 2003). It is suggested that the attentional deficits in some of these cases are due to poor arousal as a result of ineffective sensory modulation which then has an impact on the attention of the child (Schilling, et al., 2003; Buckle, et al., 2011). Through the use of the seating wedge, children with ADHD may gain additional movement while sitting in order to adjust their arousal levels. When using the seating wedge, the air in the cushion results in movement of the child in a seated position. This means that children with ADHD who would be fidgeting and walking around in an attempt to gain movement for modulation, would be getting the movement from the seating wedge while in the chair. It has also been reported that movement can aid in accommodation of arousal in the classroom which in turn improved classroom behavior (Mulrine, et al., 2008).

2.4.2 On-task behaviour

Teachers often face the challenge of managing inappropriate behaviour of children with ADHD. These include: interrupting conversations, starting conversations inappropriately, poor learning from past mistakes (such as reprimands) and variable performance in a variety of tasks (Perold, et al., 2010).

On-task behaviours are the behaviours which allow a child to be engaged in teacher assigned activity, these may include listening to instructions, asking for help appropriately, engaging in the task set out, remaining in the proper location of the task (such as at the desk) (Adams & Kumar, 2019). Children with ADHD have difficulties with managing these on-task behaviours.

Attention is an important factor in enabling appropriate on-task behaviours (Lantz, et al., 2007). Adequate on-task behaviours allow for more effective learning within the classroom environment as the child is more focused on the designated activity (Lantz, et al., 2007). As described above one can see that children with ADHD have difficulty in maintaining the adequate attention on the targets required to effectively participate in these on-task behaviours and as a result often show poor classroom performance.

Studies show that poor attention and increased postural demands in classrooms may affect on-task behaviour negatively (Schilling, et al., 2003; Kratenova, et al., 2007; Bagatell, et al., 2010; Umeda & Deitz, 2011). Occupational therapists provide intervention for the children and assist with environmental adaptations in the classroom in order to support the teachers (Department of Basic Education, 2001). This modification of the classroom environment may help reduce the effect of symptoms associated with ADHD, to promote the participation in education. There is evidence that improving the ergonomics of the classroom furniture, such as adapting seating can influence posture and can improve attention in children with ADHD through allowing more effective movement. This is in an attempt to improve their performance in the classroom (Herga & Fosnaric, 2017).

2.5 CLASSROOM INTERVENTIONS USING ADAPTED SEATING

Children with poor posture are further disadvantaged by poor ergonomics of the classroom furniture such as the chairs. Prolonged seating in the classroom may also impact academic success (Kratenova, et al., 2007). Research indicates early intervention, before the age of seven years. promotes improved sitting posture facilitated by using adaptive seating devices is beneficial in improving postural alignment by facilitating appropriate movement for achieving adequate posture (Kratenova, et al., 2007; Neville, 2005).

Previously the “90-90-90 degree” rule was used in order to ensure that the body remained in a symmetrical position, however recent research reports that this position is not likely to represent the most effective functional position (Neville, 2005). This position may result in a deterioration of adequate posture due to the child becoming fatigued (Neville, 2005). In a sitting position optimal posture can be described as:

> “Having the pelvis against the backrest in an anterior pelvic tilt. The hips, knees and ankles at 90 degrees with the feet in a planter position. The thoracic spine should be in an upright position resting against the backrest. The head position should be related to the spine and should remain in the midline” (Neville, 2005): p7.

In order to maintain an optimal sitting position at the pelvis, it is recommended to incline the pelvis at a backward point which will raise the pelvis into an anterior pelvic tilt. This will align the spine through increasing contact of the spine, with the chair and promoting a more symmetrical, upright position. Feet can be propped, if necessary, in order to maintain a planter position. There is an increase of support and thus decreasing of fatigue (Neville, 2005). Lateral flexion could be minimised by adding arm supports to the chair, however the children in this particular study have school bags besides the chair. If arm rests are provided, then there is limited access to the school bags. Seating devices such as a seating wedge can assist in achieving this posture in the classroom and may positively impact on-task behaviour through improvements in attention by providing added sensory input for arousal and since the child may require less postural control to maintain their posture there will be less attentional demands on the posture thus increasing attention available for the tasks at hand (Umeda & Deitz, 2011). The use of therapy balls, therapy ball chairs and therapy cushions in classrooms have been implemented as an environmental adaptation to improve on-task performance in the classroom although there is very little scientific evidence as to their effectiveness (Umeda & Deitz, 2011; Schilling, et al., 2003; Fedewa & Erwin, 2011; Bagatell, et al., 2010). Therapy seating wedges have also been advertised in the therapy world as benefitting children through improved posture and providing additional vestibular input to aid with attention and ability to focus through improving arousal, however limited studies exist to promote the benefits of seating wedge use, in the classroom (Murphy, et al., 2016).

A seating wedge or wedge cushion as it is also known is a device which is filled with air, placed on a chair and when sat on will allow the pelvis to tilt forward allowing the user to sit in a more upright position. This allows for correct posture thereby promoting better joint and ligament support. The improvement of sitting position is dictated by the proprioceptive system which informs where the body is in space and this improved active sitting position allows for better body awareness which promotes focus through reduced fidgeting. The use is thus beneficial for children who attempts to gain proprioceptive and vestibular input through sitting or rocking on the chair.

The air cushion can be inflated or deflated as much as necessary although the optimum inflation would be a balance between where there is no bulge and where the wedge maintains its shape when force is placed upon it. Loss of shape can be caused by over-inflating, which may result in an ineffective shape which would be uncomfortable for the user. Over-inflating has also been known to result in defective valve stoppers which can be pushed out with force in an over-inflated cushion.

FIGURE 1.1 EXAMPLES OF ADAPTIVE SEATING DEVICES INCLUDING WEDGE CUSHION/SEATING WEDGE

Tactile input is provided through small raised dimples on the surface of the cushion. The wedge is best used on the firm surface such as a hardwood chair as opposed to soft material which can result in a loss of shape and can cause slouching of the user. It is important that a demonstration of good posture is shown to the user as slouching can occur even when sitting on the wedge.

Outcomes from other literature regarding adapted seating devices vary in terms of improvements of on-task behaviour. Over-all it was determined that substantial changes in on-task behaviour were observed when a therapy ball, or therapy ball cushion was utilized (Fedewa & Erwin, 2011). It was however reported in all studies that movement in sitting was increased when the alternative device was implemented and this was concluded to be as a result of arousal which improved the participants on-task behaviour. All reports concluded that further research should be conducted and that limited research exists on this particular topic (Fedewa & Erwin, 2011; Bagatell, et al., 2010; Schilling, et al., 2003; Umeda & Deitz, 2011; Pfeiffer, et al., 2011).

2.6 SUMMARY

All children in South Africa are expected to be included in mainstream schools despite their challenges, and teachers are expected to accommodate their various leaning challenges to ensure academic success. However, this is not always possible and so inclusion in LSEN schools for children with ADHD is a common occurrence in order for them to receive the support and intervention they need (Department of Basic Education, 2001). There are a multitude of children being diagnosed with ADHD in South Africa and teachers do not have sufficient knowledge or understanding of these children and their learning challenges to teach and manage them effectively in either mainstream or LSEN schools (Vogel, 2014; Topkin & Roman, 2015). Children with ADHD present with characteristics of inattention, impulsivity and hyperactivity as well as poor posture and these challenges make it difficult for them to maintain their on-task behaviour in the classroom (Vogel, 2014). Pathology associated with ADHD and soft neurological findings within the cerebellum and basal ganglia may also impact on balance and posture, contributing to poor postural control in children diagnosed with this condition affecting their ability to maintain adequate posture. (Shorer, et al., 2012). Poor posture has been known to impact on on-task behaviours due to increased fidgeting and out of seat behaviours (Bagatell, et al., 2010; Fedewa & Erwin, 2011; Schilling, et al., 2003; Pfeiffer, et al., 2008).

As occupational therapists, we have unique professional knowledge and clinical competencies to guide teachers as to the most effective environmental adaptations. It is important to ensure that our recommendations are based on best evidence. Improving posture and attention through the use of alternative seating devices has been shown to improve the on-task behaviour of participants in a number of studies. There is little conclusive evidence, however, which promotes the use of a seating wedge as an alternative seating device. All research indicated that further studies with larger sample sizes was recommended for conclusive evidence (Bagatell, et al., 2010; Fedewa & Erwin, 2011; Schilling, et al., 2003; Pfeiffer, et al., 2011).

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. INTRODUCTION

There are many resources available to occupational therapists to aid and improve the attention, posture and on-task behaviour of children with ADHD. The use of a seating wedge in classrooms is one such resource. Chapter three will outline the research method used to conduct the study which aimed to examine the effect of these seating wedges on attention, posture and on-task behaviour and the correlation between these three variables.

The research design, sample selection and ethical considerations will be discussed first. The measurement techniques will then be outlined and lastly the research procedure and data analysis will be explained.

3.2. RESEARCH DESIGN

A quantitative experimental one-group pre-test post-test study design was chosen, as the specific variables of attention, posture and on-task behaviour were numerically quantified and explored using standardized tests and checklists (Creswell, 2003). An experimental design was needed as participants were involved in a two-week experimental intervention programme. This programme was designed to determine whether sitting on a seating wedges in the classroom improved the child's attention and posture (independent variable) and if this impacted positively on observable on-task behaviours or not (dependent variable).

One group of recruited participants was tested prior to, and following the intervention and thus acted as their own control group (Creswell, 2003). The one group pre-test post-test design allowed for testing to occur prior to intervention, giving the researcher a measure of what the attention, posture and on-task behaviour would have been like without the intervention. A major criticism of one group pre-test post-test design has been the lack of randomization as potential confounding variables cannot always be controlled (Harris, et al., 2006). However, despite these concerns, this design was the strongest design feasible for the particular circumstances at the research site and the

strengths and limitations will be discussed when presenting data collected (Harris, et al., 2006).

3.3. RESEARCH SITE

The study was conducted at a LSEN school in the Ekurhuleni district, Gauteng South Africa. There were three classes of grade one children who were all diagnosed with ADHD. All parents had already provided consent for videotaping children in the school setting, where video cameras were already installed in each of the classes.

3.4. SAMPLE SELECTION

The sample was recruited from the population of children enrolled in grade one at the research site.

The parents of all the children in the three grade one classes who met the following inclusion criteria were invited to allow their children to participate in this study (Pfeiffer, et al., 2011).

- Male and female children between the ages of six to 12 years. Children in this age group were identified as being the subject of several similar studies. The effects of daily activities, such as long periods of seating in furniture, could lead to inadequate sitting posture (Camargo, et al., 2017). Children in this age range were also selected as the implementation of intervention in this age group would have the biggest impact going forward. Sustained off–task behaviour in this age group can lead to negative academic performance and is currently of large concern in the grade one classrooms (Adams & Kumar, 2019). The attentional difficulties in children younger than six may not indicate disordered attention due to ADHD but may be as a result of other pathology such as language delays, hearing loss or poor intellectual functioning (Mahone & Schneider, 2012).
- The children who had been identified by their teachers as having difficulty with on-task behaviour.

Children who had inner ear difficulties were excluded from the sample as inner ear difficulties are reported to have a negative influence on the vestibular system resulting in a negative response to movement (Golz, et al., 1998).

A power analysis determined that a sample size of 29 participants were required for significant results, where the significance was set at 0.05 with the power set at 80% (Pfeiffer, et al., 2008).

3.5. RESEARCH PROCEDURE

3.5.1. Permission and consent for the study

Following approval from the Faculty of Health Sciences Graduate Studies committee, ethical clearance was obtained from the Committee for Research on Human Participants at the University of the Witwatersrand M160950 (Appendix A). Permission to conduct the study was also obtained from the Gauteng Department of Basic Education (Appendix B) as well as the principal of the School of Achievement in Germiston (Appendix C).

The approved Information letter (Appendix D) which outlined details pertaining to the study were sent to parents along with two consent forms (Appendix E). The parent information letter included the following information: Description of the study; request for permission for their child to participate in the study; request for permission to film their child before and after the experiment; request for completion of a demographic questionnaire; description of the benefits and risks of taking part in the study. The information sheet also stated that their child's participation was voluntary and they could withdraw from the study at any time without consequence. It was noted that all information would be confidential and no child would be identified. Parents were requested to sign and return the two consent forms if they agreed to their child's participation in the study, one for consent to participation and the other for the videotaping. Once parents had agreed to their children participating in the study, each individual child was asked to assent to their participation in the study. The children were asked verbally for their assent to participate, prior to the study by their class teacher. They were asked verbally by their class teacher as they already have a trusting relationship with her and she had no interest in whether or not the child participated. This avoided any unintentional persuasion on the part of the researcher.

Approved information letters (Appendix F) were sent to the three Grade one teachers which again detailed a description of the study; the nature of their involvement in the research including the request for them to complete the Connors rating scale on the

study participants in their class both before and after the experiment. The information sheet also stated that their participation was voluntary and they could withdraw from the study at any time without consequence. It was noted that all information would be confidential and no participant would be able to be identified. Consent forms were also obtained from the teachers in order to allow the researcher permission to conduct research within their classrooms and for them to participate in the study (Appendix G).

3.6. RESEARCH PROCESS

This study took place in three phases:

3.6.1. Pre-test phase

The study took place in three grade one classrooms where each class comprised of 11-12 children and where video cameras and recording equipment were installed and routinely used as part of the education process. Once consent was obtained from the parents and the individual children gave verbal assent to participate, parents were asked to complete and return the demographic questionnaires (Appendix H) and teachers completed the pre-experiment Connors Rating Scale (long version) on each participant (Appendix I) and these were returned to the researcher. Each participant was allocated a participant number to ensure confidentiality, these were allocated randomly using the research randomizer tool which generated random numbers which were then assigned to each participant ensuring the researcher remained blinded to the forms. The correct ergonomics for each child was ensured by providing foot stools to ensure feet placement was appropriate and children's chairs were at the correct height for their desk. The participants were filmed in their natural classroom environment and where the cameras that were set up were hidden. This was done in order to prevent the participants from changing their behaviour in response to being filmed, also known as "the Hawthorne effect" (Houser, 2014). The first pre-experiment 10 minutes' video recording was taken during the second period of the morning. This was pre-programmed so children were unaware that they were being videoed. This allowed for the participants to respond naturally in a familiar environment.

Before the start of the experiment the participants were given an opportunity to interact with the seating wedge, in order to reduce the effects of novelty.

3.6.2. Intervention:

The intervention phase occurred when the seating wedges were implemented in the classroom. The participants each received a seating wedge which was fitted with the child and then placed on the school chair for the duration of the school day. The intervention continued for 10 consecutive school days in order to allow for effects of novelty of having the cushion in the classroom. Novelty (or disruption effect) was considered during the planning of the study. The researcher ensured that any changes in on-task behaviour did not occur due to exposure to something novel, the participants were given two weeks for the effects of novelty to wear off (Houser, 2014). The practicality of implementing a longer study in the setting was not feasible due to term lengths, public holidays and examination timetables. Two weeks was considered as an acceptable time period based on the internal consistency coefficients of the Conner's Rating Scale which indicated that even after two weeks of intervention internal consistency coefficients range from.77 to .97 and the test-retest reliability coefficients range from .70-.98 (Conners, 1989) and thus two weeks was determined to be an acceptable time period for intervention.

During the intervention phase the teachers ensured that the participants who were allocated the seating wedge were using it and that it was adequately inflated, all teachers are already familiar with the correct inflation of the wedge cushions as they have had prior training at the beginning of each year when making use of the seating wedges in the classroom.

3.6.3. Post test phase:

On the last day of the intervention phase, the first 10 minutes of the second period lesson, the participants were filmed for a second time while seated on the seating wedges. Teachers were asked to complete the second Connors rating scale on each participant and return it to the researcher. The researcher scored the pre- and post-Connors Rating Scales, as per the manual, which were received back from the teachers.

The video analysis of the video footage of each of the participants in the classroom was done by a team of experts (three expert clinicians) who scored the participants' behaviour using the Daily Behaviour Assessment Scale (Appendix J) and their

posture, using the Chailey Levels of Ability (Appendix K). The clinical experts were recruited based on their experience working with children. According to Rassafiani et al (2005) and supported by Unsworth (2001) and Hagedorn (1996) there is little change in the clinical reasoning of practitioners with five years of experience compared to those with more than five years of experience. In these studies, a clinical expert was considered to be a practitioner with five years of experience or more (Unsworth, 2001; Rassafiani, et al., 2005; Hagedorn, 1996) clinical experts had a minimum of five year's occupational therapy experience in practice specifically with children in the context of a LSEN school. Three participants who met the inclusion criteria and gave their consent to participate were selected (Appendix L)

3.7. MEASUREMENT TECHNIQUES

Four measurement tools were used to collect the data for this study:

3.7.1. Demographic questionnaire (Appendix H):

This was compiled by the researcher and was completed by the parents in the pre-test phase of the study. The questionnaire included demographic information such as the child's age, gender, medication, other therapies received, medical history including a history of ear infection and current ear infection.

3.7.2. Connors Rating Scale: (Appendix I)

The Connors rating scale was developed by C. Keith Connors Ph.D. from 40 years of research in child psychology (Connors, 2008). This scale is particularly aimed at assessing components of the Attention Deficit (Hyperactivity) Disorder of children six to 18 years of age. It is considered an invaluable tool in research contexts as well as for treatment and assessment of children with ADHD (Connors, 2008; Waschbusch & Willoughby, 2008). The Connors rating scale is a measure of inattention, hyperactive-impulsive behaviour as well as oppositional defiant behaviours in children (Waschbusch & Willoughby, 2008; Purpura & Lonigan, 2009). This test has scaled scores which have a good internal consistency which is reasonable for screening for ADHD (85% of children correctly classified) and also for measuring treatment responses (Waschbusch & Willoughby, 2008; Conners, 1989). There were high validity and reliability of scores when completed by teachers (Waschbusch &

Willoughby, 2008; Conners, 1989). This test has been reported as a “Psychometrically sound measure” of inattention, hyperactive-impulsive behaviours as well as oppositional defiant behaviours particularly when completed by teachers (Waschbusch & Willoughby, 2008): p189. The internal consistency coefficients for total sample ranges from 0.77 to 0.97 and the 2-to-4-week test-retest reliability coefficients range from 0.70-0.98 (Connors, 2008). The Connors rating scale has been used in multiple studies worldwide including studies which have been cited over 2000 times (Abdullah, et al., 2019), drug trials (Werry, et al., 1975) and placebo-controlled studies (Spencer, et al., 2002). A South African study reported on the similarity in prevalence rates for ADHD in South Africa to be in line with American and European results as per the Connors rating scale (Meyer, et al., 2004). The Conner’s Rating Scale includes 9 inattention items, 6 hyperactivity items and 3 impulsivity items (Purpura & Lonigan, 2009). It has a test-retest reliability and internal consistency with all correlations significant where $p < 0.001$. It has also been tested for factorial, construct and predictive validity (Stein & Wheldon, 2020). Normative data includes over 1000 parent, teacher and self-report rater’s and separate norms are provided for males versus females in yearly intervals (Stein & Wheldon, 2020).

The Connors rating scale was completed for each child by the teacher, prior to commencement of intervention as well as following the intervention. On completion of the Connors rating scale the researcher then scored all tests manually as described in the manual, producing standardized T-scores (Conners, 1989) which were then tabulated in an EXCEL spreadsheet and analysed as described in the data analysis section.

3.7.3. Daily Behaviour Assessment Scale: (Appendix J)

It was determined that the best method to evaluate the participants behaviour was through the use of a behavioural rating scale (Demopoulos, 2010; Delsemme, 2015; Volpe, et al., 2011; Adolphus, et al., 2013; Edwards, 1986). The Daily Behaviour Assessment Scale was determined to be the best fit for the behaviours within the classroom due to its use within the South African context in previous studies (Demopoulos, 2010; Delsemme, 2015; Edwards, 1986). This scale was initially developed by an occupational therapist in South Africa in 1986 and was used to evaluate behaviour within the classroom on children with learning difficulties (Edwards,

1986). It was then used in two recent South African studies to measure the change in behaviours within the classroom based on various interventions (Delsemme, 2015; Demopoulos, 2010). The Daily Behaviour Assessment Scale consists of 8 sections evaluating concentration and attention, behaviour in groups, perseverance and task completion, organisational ability and the ability to cope with new situations as well as social interaction, responsibility, initiative and emotional control (Delsemme, 2015). The original scale was adapted by M Demopoulos in 2010 through expert-jury validity for a study of negative on-task behaviours and the link to sensory processing to these negative behaviours. Twelve out of the 32 behaviours identified in the original version were selected as being the most overt behaviours for measurement of classroom participation (Demopoulos, 2010). The scale was adapted to include sections which evaluate concentration and attention, behaviour in class, perseverance and task completion, organizational ability, ability to cope with new situations, responsibility and initiative as well as emotional control (Demopoulos, 2010). Interrater reliability was established for the study by Demopoulos (2010). The adapted version from this study was utilised as it was determined that the behaviours which are needed for classroom participation particularly on-task behaviours (Adams & Kumar, 2019). The Daily Behaviour Assessment Scale was used to evaluate the children's' behaviour during the two 10-minute recorded video sessions, one before the experimental intervention and the second one after.

Three expert clinicians trained in the use of the Daily Behaviour Assessment Scale scored the on-task behaviours of the participants from the video footage. Interrater reliability was established between the three expert clinicians. The most common method of determining interrater reliability was used and this evaluated the consistency of answers between the experts of repeated assessments and across items (Volpe, et al., 2011). Errors were then observed and discussed in order to ensure that the following scores are a true representation of the average (Volpe, et al., 2011). The measurement of results should remain relatively stable over time and this method of classical test theory is a common method of examining reliability and ensuring consistency (Volpe, et al., 2011).

In order to ensure test-retest reliability and inter-rater reliability the expert clinicians were involved in a training session in which 5 mock up videos were used with children

known to the researcher whose parents consented to having their children filmed. The videos were then used to score a Daily Behaviour Assessment scale. Each expert clinician scored the same child and the scores were then examined and discrepancies recorded and discussed. This continued until the average score of all the expert clinicians was the same.

3.7.4. Chailey Levels of Ability: (Appendix K)

The Chailey Levels of Ability are a measure of biomechanical and developmental changes used mainly in children with cerebral palsy in order to record discrete changes in ability (Poutney, et al., 1999).This test has been used extensively for over 10 years in both clinical settings as well as for research purposes. The content validity and criterion validity have been established with high correlations (Poutney, et al., 1999). The Chailey Levels of Ability focus on changes in position and movement of the shoulder girdle, pelvis, head and limbs and this allows observations to be made in terms of postural control within the 7 levels identified in the sitting position (Gaetan, et al., 2002). There are few clinical standardised assessments which measure postural control in children (Kyvelidou, et al., 2013). Most studies evaluating postural control have focused on the postural sway in the standing position (Reiley, et al., 2008; Kapoula & Bucci, 2006; LeClair & Riach, 1996; Shumway-Cook & Woollacott, 1985) , other studies used observation of the positions and alignment of different bony structures however these observations do not provide standardised scores relating to postural control in a seated position (Kratenova, et al., 2007; Camargo, et al., 2017). The Chailey Levels of Ability is a standardized test which evaluates the postural control based on the position a child can assume and gives scores specifically when a child is in a seated position. Although it has typically been used in the evaluation of children with Cerebral Palsy it has been used to compare children with normal development as well (Gaetan, et al., 2002). One South African study was found which made use of the Chailey Level of Ability to investigate the effect of cognitive load on children with and without postural control difficulties and the charts used by Bennie 2011, were used to evaluate the participants in this study (Bennie, 2011). These included evaluation in a seated position to score the load-bearing of the pelvis, feet and legs during sitting, the position of the shoulder and pelvic girdle, the spinal profile as well as the chin, trunk and hip position. Based on the position, the participant would get a score of 1-7 which

would determine the overall level of ability, but would also give an idea of changes between each position (Bennie, 2011). Pre-test and post-test photographs were taken and analysed by the three clinical experts using the Chailey Levels of Ability. Inter-rater reliability was established between the clinical experts upon scoring the photograph data of the children included in the training session described above. In order to ensure test-retest reliability and inter-rater reliability the expert clinicians were given photographs of children known to the researcher whose parents consented to have their children photographed. The photographs were then used to score a Chailey level of Ability. Each expert clinician scored the same child and the scores were then observed and discrepancies recorded and discussed. This continued until the average score of all the expert clinicians was the same.

3.8. ETHICAL CONSIDERATION

The Belmont Report is a basic summary of all ethical principles for the conduction of research involving human subjects (The Belmont Report, 1974). All ethical principles set out by the Belmont Report were adhered to during the execution of this research study. The intervention described as the experiment in this study was designed to evaluate the effect of using a seating wedge to enhance practice was ethically sound in continuing simultaneously (The Belmont Report, 1974).

Autonomy was ensured in that each participant, as well as their parents, had their own choices considered. They were asked whether or not they would like to be a part of the study and were in no way forced to participate. Comprehensive details of the study were given to parents in the form of an information letter and parents gave consent legally on behalf of their child through a signed consent form. It was explained to the children invited, in age-appropriate terms, what the expectations of the study were. The children were then asked verbally for their assent to participate, prior to the study by their class teacher. They were asked verbally by their class teacher as they already have a trusting relationship with her and she had no interest in whether or not the child participated. This avoided any unintentional persuasion on the part of the researcher. Participants were also given the opportunity to withdraw from the study at any time without any consequences to either the education which they were receiving or the additional therapy they were participating at the time of the study.

Beneficence was ensured in that the intervention has been deemed to have no risk for injury to the child in any way. The children at risk for injury when using a seating wedge would be children with potential for hip dislocation or children with such severe low muscle tone that they are at risk for falls (Watanabe, 2020). At the school where participants were selected, children do not present with such severe physical limitations. The only concerning factor was if a child had an ear infection, as there have been reports of vestibular dysfunction in children with ear infection in which case the additional vestibular movement of the seating wedge may pose a problem (Golz, et al., 1998). In order to compensate for this, any child with an ear infection was excluded from the study. There were thus no risks to participants when participating in the study. The potential benefits were not to the individual participants but the evidence to support the acquisition of resources such as seating wedges within the classroom environment if a positive impact the on-task behaviour of children and potentially improve their academic performance was the result of the study.

Justice: In order to ensure that all children were given the opportunity of benefiting from (even short term) improvements in on-task behaviour within the classroom, all children in all grade one classes were invited to participate. Every child received an invitation and following invitation. Children who did not fulfil the requirements of the study, were then informed of their exclusion along with a detailed reasoning as to why they were to be excluded. Two children were excluded from the study due to their absence on the first day of data collection. Their parents were informed of their exclusion; however, these two children were still allowed to use the seating wedge for the duration of the study and were just excluded from video analysis.

Confidentiality: Each child received an identification code on their completed demographic form and this code was used throughout the study in order to maintain confidentiality. These codes were randomly generated using a random research code generator online.

3.9. DATA ANALYSIS

All data was transcribed onto an EXCEL spreadsheet.

Demographic data was analysed using descriptive statistics in terms of frequencies.

In order to determine the change of using a seating wedge in the classroom on posture, attention and on-task behaviour, statistical analysis was performed to determine whether any significant changes were observed pre-and post- intervention (objective 1). Data was analysed using STATISTICA version 13.3 (TIBICO Software Inc, 1994). The data was obtained from the Connors rating scales the modified Chailey levels of Ability as well as the adjusted Daily Behavioural Assessment Scale. The Connors rating scale was examined using standard scores which are an interval scale so paired t-tests (parametric comparison) were used to determine the before and after difference with the p-value set at ≤ 0.05. Cohen's d was established using means and standard deviations to determine clinical change between the two groups. A small effect is seen in groups with Cohen's d of 0.2, medium effect is observed at 0.5 and large effects are observed at 0.8 or more (Lakens, 2013).

Wilcoxon sign rank test for matched pairs (non-parametric comparison) was used to determine statistically significant changes in the modified Chailey's level of Ability and the Daily Behaviour Checklist and Cohen's r was established for each group using medians and quartile ranges to determine clinical changes between the two groups. Cohen's r can depict the effect size in smaller samples. A small effect is seen in groups with Cohen's r of 0.1, medium effect is observed at 0.3 and large effects are observed at 0.5 or more.

In order to compare the change in posture and attention and on-task behaviour to population norms when using a seating wedge in the classroom, the researcher used graphs depicting the mean scores pre-and post-intervention and indicated the change according to the population norms (objective 2). The change in posture was assessed using the Modified Chailey with on-task behaviour. The mean before and after, standard scores for the Conner's Rating Scale and the pre-and post-median scores for the modified Chailey's Level of Ability and the Daily Behaviour Checklist were compared to the mean for typical children on each test. This allowed the deficits in attention, behaviour and posture in the sample to be determined pre-and post-intervention.

In order to correlate the changes in posture, attention and on-task behaviour before and after intervention using a seating wedge in the classroom, (objective 3) a non-parametric correlation of attention assessed by the Conner's Rating Scale and the posture assessed by the Modified Chailey with on-task behaviour when using a seating wedge in the classroom, the change in the scores from pre and post intervention with the seating wedges were determined and correlated using Spearman's correlation coefficient for ordinal data (non-parametric comparison).

3.10. CONCLUSION

A non-blinded, one group, pre-test-post-test design was used on a single group of participants to determine the effects of a seating wedge on the attention and posture of children in an LSEN School and determine whether these effects would in turn impact on the child's on-task behaviour. The results will be described in Chapter Four.

CHAPTER FOUR: RESULTS

4.1. INTRODUCTION

This chapter reports on the results of the study. The purpose of this study was to expand upon the limited research available on the effectiveness of using seating wedges to improve on-task behaviour in children with postural control and attention difficulties, and assist in answering the research question “Does using a seating wedge improve on-task behaviour in children with postural and attention difficulties?”

The results relating to participant’s demographics, are reported using a number of tables.

The results of the experiment are reported according to the three objectives:

Objective 1 The change in attention, posture and on task behaviour after using the seating wedge is then conveyed using a series of tables detailing the results.

Objective 2 The change in attention, posture and on task behaviour before and after using a seating wedge is then compared to population norms using a series of graphs.

Objective 3 A correlation of significant changes between attention, posture and on-task behaviour after using a seating wedge is then described in a table.

4.2. THE SAMPLE

Thirty-six participants were recruited for this study. All children approached had been diagnosed with ADHD and had confirmed attention problems identified by their teacher. They all met the inclusion criteria and no children were identified as having inner ear difficulties which was the only exclusion criteria. Two children were not at school on the day of video data collection and were thus excluded from the study. A total of 34 participants completed the study. The demographic profile of the sample is reported below.

4.2.1 Demographic profile of the sample

Table 4.1 illustrates the age and gender of the 34 participants who took part in the study.

Table 4.1 Age and gender of the sample(N=34)

	Demographic Information	n	Frequency (%)
Age	6 years old	6	11,77%
	7 years old	12	41,17%
	8 years old	15	44,11%
	9 years old	1	2,94%
Gender	Male	29	85,29%
	Female	5	14,70%

As seen in Table 4.1, most of sample were seven and eight-year-old children (41.17 and 44.11% respectively). The majority of children who participated in the study were male (85.29%).

Table 4.2 reports the medication which the participants were taking at the time of the study. The highest number of children were taking Ritalin (n=11;29.72%) and Concerta (n=7;18.,9%). All participants were reported to be stable on their medication and no medication changes took place for the duration of the study.

Table 4.2 Medication used by the participants.

Medication	n	Frequency %
Ritalin	11	29.72%
Strattera	1	2.70%
Concerta	7	18.9%
Risperlet	2	5.40%
Risperidone	2	5.40%
Contramyl	2	5.40%
Neucon	4	10.81%
Risnia	1	2.70%
Lorian	1	2.70%
Zoxadon	1	2.70%
None	5	13.5%

4.3 PRE AND POST EXPERIMENT SCORES FOR OBJECTIVE 1

4.3.3 Connors Rating Scale

Table 4.3 illustrates the results of the t-test for independent samples of Connors Rating Scale subtests pre- and post-use of the seating wedge to determine the change in attention post using the seating wedge.

Table 4.3 Change in attention pre- and post- intervention

Subtest	Conner's scores pre intervention	Conner's scores post intervention	T-test for Independent Samples		
	Mean (std dev)	Mean (std dev)	t-value	p	Effect size (Cohen's d)
Inattention	61.09 (11.33)	59.15 (10.9)	0.70	0.482	-0.17
Hyperactivity	61.90 (15.82)	58.54 (15.08)	0.88	0.388	-0.22*
Learning problems/ executive function	60.54 (12.52)	59.95 (12.39)	0.18	0.851	-0.05
Learning problems	59.78 (10.03)	59.12 (9.98)	0.27	0.787	-0.07
Executive function	55.72 (12.62)	55. 12 (11.92)	0.20	0.841	-0.05
ADHD Hyperactive	59.51 (12.64)	58.45 (12.52)	0.34	0.733	-0.08
ADHD Combined	60.57 (15.93)	57. 93 (15.20)	0.68	0.494	-0.17

Significance p ≤ 0.05* Cohen's d small effect size = 0.20*
Significance p ≤ 0.01** Cohen's d medium effect size = 0.50**
Cohen's d large effect size = 0.80**

Table 4.3 illustrates that there was very little change in the attention from pre to post intervention using the seating wedge. The effect sizes showed no clinical change except for hyperactivity where the effect size was small. The results of the t-test indicate that no statistically significant difference was observed in any of the groups.

4.3.3 Chailey Levels of Ability

Table 4.4 illustrates the comparison of the results from the Chailey Levels of Ability pre- and post-use of the seating wedge to determine the change in posture post use of the seating wedge

Table 4.4. Pre and Post scores for the Chailey Levels of Ability

Position:	Group 1	Group 2	Wilcoxon Matched Pairs Test		
	Median (Quartile Range)	Median (Quartile Range)	t-value	p	Effect size (Cohen's r)
Loadbearing	7 (7-7)	7 (7-7)	37.50	0.000*	0.60***
Shoulder girdle	7 (5-7)	7 (5-7)	6.00	0.201	0.23*
Pelvis position	7 (4-7)	7 (5-7)	15.00	0.009*	0.47**
Spinal Position	7 (5-7)	7 (7-7)	21.50	0.374	0.16*
Chin position	5 (5-7)	7 (7-5)	8.00	0.905	0.02
Trunk position	7 (7-7)	5 (5-7)	8.00	0.310	0.18*
Total Chailey	52 (49-54)	54 (50-56)	62.50	0.004*	0.52***

Significance p ≤ 0.05* Cohen's r small effect size = 0.10*
Significance p ≤ 0.01** Cohen's r medium effect size = 0.30**
Cohen's r large effect size = 0.50**

Statistically significant changes (p= 0.05) are observed in loadbearing and pelvis positions as well as in the total Chailey scores. This indicates that there was a change in the posture, specifically at the pelvis as well as loadbearing and as a whole, pre- and post- using the seating wedges. A large clinical effect size was seen for loadbearing and the total modified Chailey score indicting significant clinical change in posture for these components. There was also a medium effect size for the position of the pelvis and a small effect observed in all other positions except the chin position.

4.3.3 Daily Behaviour Checklist

Table 4.5 illustrates the results of comparison of the Daily Behaviour Checklist subtests pre- and post-use of the seating wedge to determine the change in on task behaviour post use of the seating wedge.

Table 4.5 Pre and Post scores for the Daily Behaviour Checklist

Behaviour	Pre- Scores	Post- Scores	Wilcoxon Matched Pairs Test		
	Median (SD)	Mean (SD)	t-value	p	Effect size (Cohen's r)
Internally distracted	0.51 (1.36)	1.06 (1.59)	16.50	0.023*	0.41**
Externally distracted	4.16 (3.89)	3.35 (3.91)	4.00	0.002**	0.55***
Poor motivation	0.29 (1.44)	0.05 (0.35)	2.00	0.592	0.10*
Fidgety	3.19 (3.97)	2.74 (3.99)	14.00	0.313	0.18*
Movement seeking	0.58 (1.11)	1.16 (2.20)	52.50	0.255	0.20*
Disruptive	0.19 (0.74)	0.22 (0.80)	3.00	1.00	0.00
Speaks out of turn	0.10 (0.7)	0.74 (2.08)	2.00	0.138	0.27*
Disorganized	0.45 (0.80)	0.09 (0.30)	2.50	0.029*	0.39**
Can't get down to work	0.70 (1.13)	0.32 (0.94)	18.50	0.107	0.29*
Slow task completion	0.64 (1.22)	0.32 (0.87)	5.00	0.068	0.33**
Impulsive	0.32 (0.83)	0.16 (0.45)	15.50	0.406	0.15*

Significance p ≤ 0.05* Cohen's r small effect size = 0.10*
Significance p ≤ 0.01** Cohen's r medium effect size = 0.30**
Cohen's r large effect size = 0.50**

Statistically significant effects are observed in the participant's distractibility, both internally (p= 0.025) and highly significant change for external distraction (p= 0.002).

There was also a statistically significant effect in the reduction of disorganized behaviour (p=0.029). Large effect sizes indicating clinically significant change in internal and external distractibility were also found. The clinical change for disorganized behaviour had a medium effect size as did slow task completion and speaking out of turn (Cohen's r= 0.39). Small effect size showed a small clinical change in the reduction of movement seeking behaviour (Cohen's r= 0.2), getting down to work (Cohen's r= 0.29), poor motivation, fidgety, movement seeking and impulsive. Thus, the effect of the seating wedge did impact areas of on-task behaviour.

4.4 COMPARISON OF PRE AND POST INTERVENTION COMPARED TO POPULATION MEANS (OBJECTIVE 2)

Figure 4.1 Mean Scores for Conner's Rating scale – pre-and post- testing illustrates the comparison of mean scores for the Connor's Rating compared to population means as described by the Connor's Scoring Manual. The General population line indicates the mean scores for the general population indicating no dysfunction in that sub-test for the sample in this study. It is clear in this graph that the mean scores for executive function, are within the normal range both pre- and post- testing.

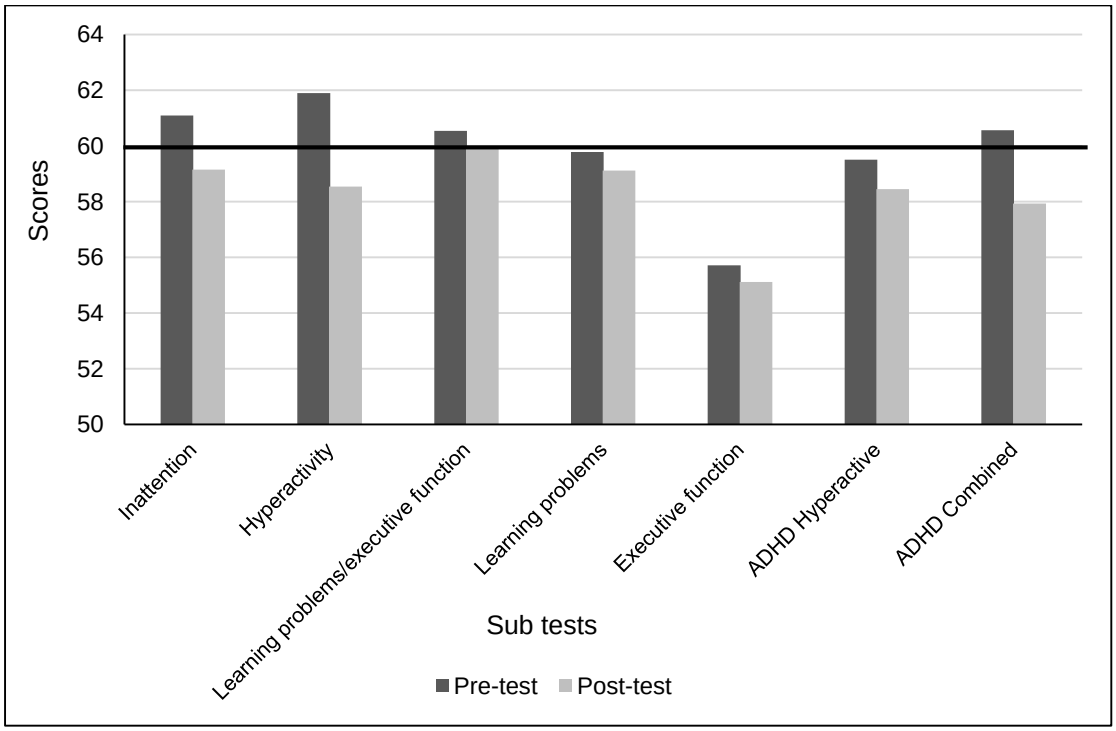

Figure 4.1 Mean Scores for Conner's Rating Scale – Pre and post testing compared to population means

Learning problems/executive function combined did show a slight decrease following the intervention but not to the normal range. Inattention, hyperactivity, learning problems, ADHD. hyperactive and combined subtests were all in the “elevated range” (scores above 59) prior to intervention. These scores all reduced into the normal range following intervention.

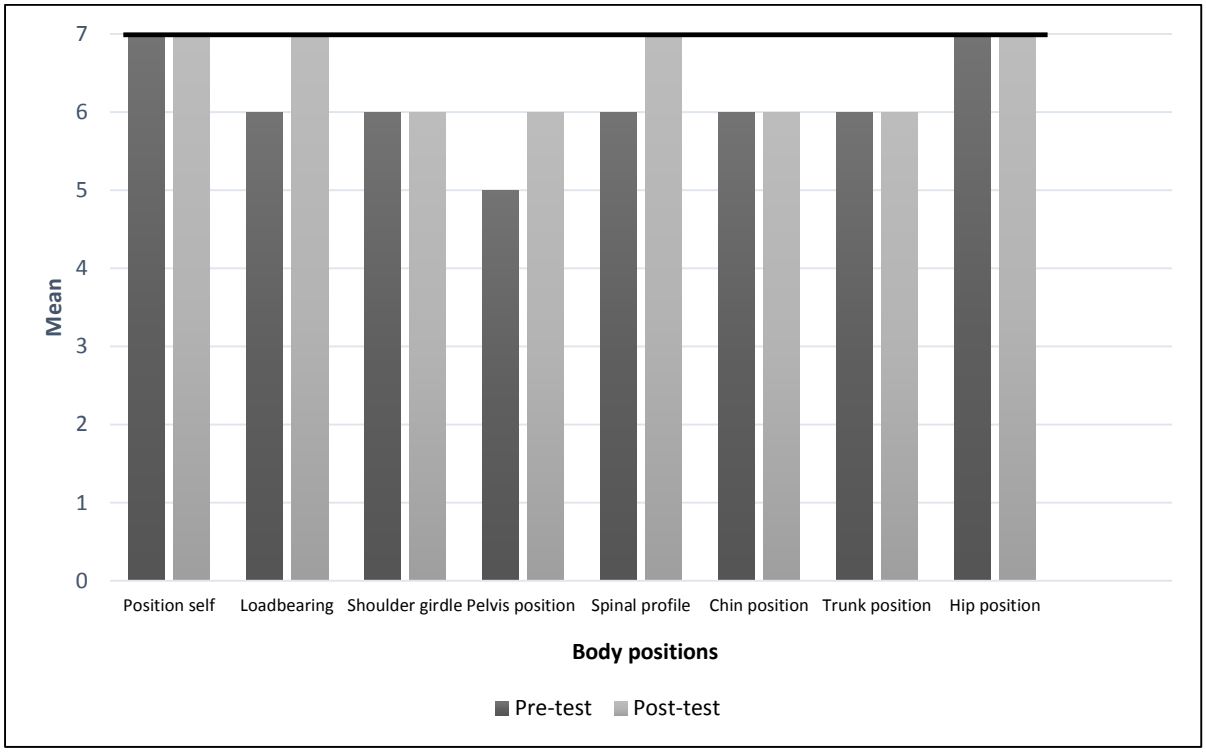

Figure 4.2 Mean scores for Chailey levels – Pre and post intervention

Figure 4.2 Mean scores for Chailey levels – re- and post-intervention: illustrates the change in mean scores of the Chailey Levels of Ability pre- and post-intervention. The expectation is for participants to reach the maximum score of 7 which indicates the normal position. The participants were able to position themselves and their hips in the adequate position prior to intervention (mean=7). Improvements in loadbearing (mean= 7), pelvis position (mean =6) and spinal profile (mean= 7) were observed following intervention.

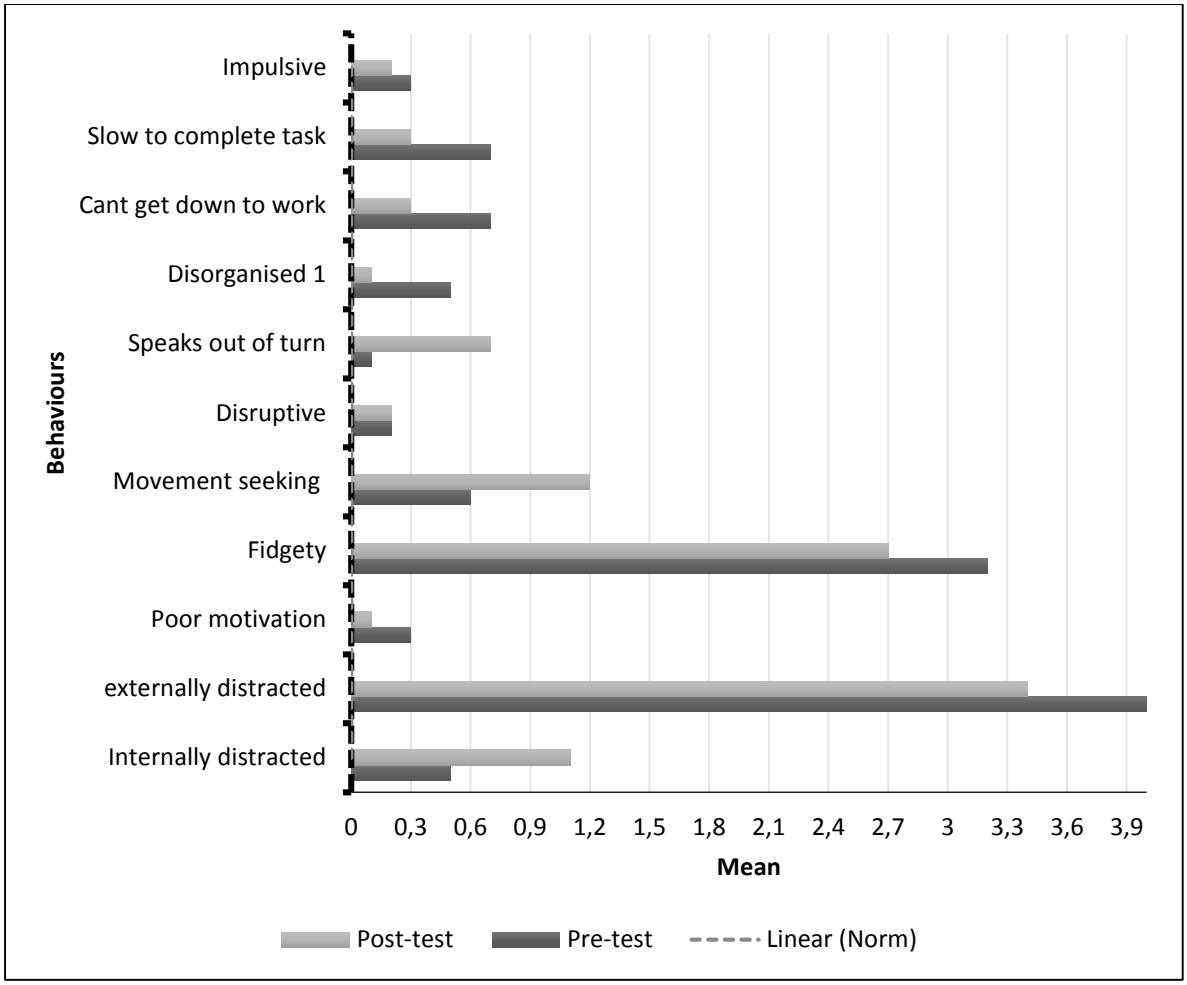

Figure 4.3 Mean scores for Behaviour Daily Checklist– Pre and post intervention

Figure 4.3 Mean scores for Behaviour Daily Checklist– Pre and post intervention: illustrates the comparison of mean scores of the Daily Behaviour Checklist pre- and post-interventions. The expectation is for participants to display less behaviours in order to present closer to the norm (mean =0,0). Following intervention, all behaviours decreased except: speaking out of turn (mean=0.7), movement seeking (mean = 1.2) and internal distractibility (mean =1.1), which increased following intervention.

4.5. CORRELATION BETWEEN CHANGE IN ATTENTION AND POSTURE CHANGE ON ON-TASK BEHAVIOUR (OBJECTIVE 3)

Table 4.6 illustrates the correlation between The Conner's Rating Scale and the Daily Behaviour Checklist. These tests allow one to correlate the changes in attention as described by the Conner's Rating Scale with the participants on-task behaviour as described by the Daily Behaviour Checklist. Moderate positive correlations exist between learning problems/executive functioning problems combined and disruptive

behaviour (r= 0.44). This means that as improvements are noted in disruptive behaviour so too are improvements noted in learning problems/executive functions combined.

Table 4.6 Correlations between change in attention and posture change on on-task behaviour

Subtests	Spearman Rank Order Correlations:					
	Movement Seeking	Disruptive	Speaks out of turn	Disorganized	Can't get down to work	Slow to complete tasks
Learning problems/executive function	-0.27	**0.44***	0.01	0.20	0.05	**0.50**
Learning problems	0.14	0.04	**-0.54***	0.21	**0.50***	0.32
Aggressive/defiant	**-0.40***	-0.10	-0.20	**0.54***	0.12	0.20
Total Conner's Change	**-0.50***	0.10	-0.10	0.20	-0.20	0.10
Chailey level of Ability	0.11	0.35	0.26	-0.24	-0.03	0.13

Moderate Correlation 0.4-0.6

There is a moderate positive correlation between learning problems/executive functioning problems combined and speed of task completion (r=0.50). This means that as the speed of the task improves, improvement is also observed in the learning problems/executive skills combined. When learning problems are isolated, it is possible to observe a moderate negative correlation (r=-0.54) between learning problems and speaking out of turn. A moderate positive correlation is observed between learning problems and the ability to get down to work. Learning problems become less prominent as the participant's ability to get down to work improves. There is a moderate positive correlation (r=0.54) between aggressive/defiant behaviour and disorganization. The less disorganized a child becomes, the less aggressive they become. Overall, there is a moderate negative correlation (r=-0.50) between movement seeking and overall changes in the Conner's scores of the participants. With an increase in movement seeking behaviour, an improvement in the over-all Conner's score was observed.

The correlation between the total changes of the Chailey Levels of Ability and the Daily Behavioural Checklist gives an indication as to whether there is a correlation between the change in posture (as determined by the Chailey Levels of Ability) and the on-task

behaviour (as determined by the Daily Behavioural Checklist). The correlation post testing was r= 0.10 indicating that no strong correlation exists between these variables.

4.6. CONCLUSION

In conclusion, the results above indicate that there are significant effects from the use of the seating wedge on some aspects of attention, posture and on-task behaviour when considered in isolation. There are also clinical impacts on the use of the seating wedge on some aspects of posture, attention and on-task behaviour when considered in isolation.

When using the seating wedge there are no statistically significant or clinical changes in any areas of attention, except a small clinical effect seen in hyperactive behaviour. In terms of posture and on-task behaviour both statistically and clinically significant changes were observed.

When comparing attention to the population norms there was an improvement in all areas of attention except the learning/executive function combined subtest which did indicate improvement but not to the population norm. In terms of posture, improvement to the population norm was noted in all areas except the pelvis position although improvement was noted it was not to the population norm. Chin position showed no change. When compared to the population norms, the majority of subtests of on-task behaviour came closer to the population norms except for speaking out of turn, movement seeking and internal distractibility. Overall, there was improvement compared to the population norm in attention, posture as well as on-task behaviour.

Over-all there was no significant correlation between posture and on task behaviours, however there were strong correlations between attention and on-task behaviours.

When considering both significant and clinical effects of the seating wedge, on on-task behaviour, the null hypothesis that using a seating wedge does not influence on-task behaviour in children with attention and postural deficits, at a LSEN school can be rejected. There was clear evidence as demonstrated above to indicate that there is an influence on-on task behaviour in these children.

CHAPTER FIVE: DISCUSSION

5.1. INTRODUCTION

Chapter 5 discusses the results of the study. Firstly, the prevalence of ADHD in the sample population and the consistency of demographic results with population norms were discussed. This was followed by a discussion of the changes in extraneous variables of attention, posture and on-task behaviour and the implications of these findings related to the current literature (Objective 1). Changes in attention, posture and on-task behaviour of participants before and after the experiment were then compared to population norms and discussed (Objective 2). The correlation of changes of attention and posture to on-task behaviour was also highlighted (Objective 3). Finally, the Limitations of the study were discussed.

5.2. DEMOGRAPHIC PROFILE OF PARTICIPANTS

Children who cannot be accommodated in mainstream schooling environments are referred to LSEN schools where their special educational needs are considered and environmental adaptions, different teaching styles and approaches are implemented in order to accommodate their learning deficits (Anderson et al., 2012). Children require a specific medical diagnosis in order to be accepted into an LSEN school. Attention Deficit Hyperactivity Disorder is one of these diagnoses. All children who participated in this study all had a confirmed diagnosis of ADHD.

Attention Deficit Hyperactivity Disorder is characterised by inattention, impulsivity and hyperactivity. It is reported to be four times more prevalent in boys than girls (Vogel, 2014). In this study 85.29% of the participants were boys and 14.7% were girls which is consistent that the gender ratio reported in the literature and other studies on children with this disorder (Munks, 2013; Vogel, 2014)

The results indicated that only 11% of the children were aged six with the majority of participants being almost equally spread between the ages seven (41%) and age eight years (44%) and only 2% of the children being in the nine-year-old category. This is consistent with age norms of the grade one population, as per the South African School Act 1996, which informs schools that children must be in admitted to grade one by the age of seven years (Government Gazette, 1996). In special circumstances if a child is deemed ready, they are able to start in the year that they turn six years old

(Government Gazette, 1996). It is also a regulation that children should not remain in the same grade for more than three years (Government Gazette, 1996), thus children who are eight, nine or ten years would potentially be in the grade one due to an inability to move onto the next grade due to poor academic competence. From clinical experience the researcher has noted that it is not unusual for children in a LSEN school environment to repeat grade one after having transferred from grade one in a mainstream environment due to poor readiness to progress to the next grade. Thus, the typical distribution in terms of age for grade one in the LSEN school environment would be a majority of children between the ages of seven and eight years and a small percentage of children who may be six or nine years. The sample of this study matches these expectations.

Teachers often initiate the referral for diagnosis of ADHD when the child is identified as having special needs (Vogel, 2014). Parents are then required to follow procedures in order to have their child diagnosed by the relevant health care provider either a child psychiatrist or paediatrician. In order for a diagnosis of ADHD to be made, an extensive background history is taken and observation of the child's behaviour in a variety of settings is considered. The reports from parents, teachers and other health care professionals like occupational therapists are vital in making a conclusive diagnosis (Vogel, 2014; Snider and Busch, 2003). In this study, all children had a confirmed diagnosis of ADHD which was confirmed by teachers who have access to the school admission documentation which includes information regarding the formal diagnosis. All children were reported by teachers to have both postural and attention deficits in the classroom. Teachers in the LSEN classroom are obligated to undergo regular training in a variety of areas as provided by the Department of Education (Department of Basic Education, 2001). This allows for them to have extensive knowledge in areas of posture as well as attention. The teachers at the research site also work closely with occupational therapists within the classroom who also supplemented this training and provided knowledge and guidance regarding attention as well as postural difficulties for each individual child as part of the occupational therapy process.

Attention Deficit Hyperactivity Disorder is a disorder which has the classic symptoms of inattention, impulsivity, hyperactivity or a combination. In order to treat these symptoms medication is typically prescribed by a doctor or specialist in order to affect the dopaminergic systems of the brain to reduce inattention and hyperactivity (Shorer,

et al., 2012). All but five (13.5%) of the participants had pharmacological intervention to manage their symptoms of inattention and hyperactivity. These results are thus typical of reports that in 80% of cases, pharmacologic intervention is the primary treatment for ADHD (Ahmed, et al., 2014). The most commonly used stimulant is methylphenidate which goes by the pharmacological name “Ritalin” (Vogel, 2014). Results of this study reported that 29% of the participants were taking Ritalin for their ADHD, this was the highest percentage compared to the other drugs reported by participants’ parents. Concerta was the second most commonly used drug which was being taken by 18% of the children and Neucon was third being taken by 10.81% of children. Concerta and Neucon are also both types of Methylphenidate, thus in total 69.42% of the children in this study were taking a form of methylphenidate and this correlates to the previous research further confirming that the medication used by the children in this study was consistent with medical practices reported in the literature (Vogel, 2014; Wilens & Spencer, 2010).

These results indicate that the sample is representative of population of ASD children and therefore the sample was appropriate for this study.

5.3. CHANGES IN ATTENTION, POSTURE AND ON-TASK BEHAVIOUR BEFORE AND AFTER USING THE SEATING WEDGE

The first objective of this study (see 1.5) aimed to determine whether there were any significant changes in any of the areas of attention, posture or on task behaviour when the experiment of sitting on a wedge cushion for a two-week period was implemented. Changes were measured by the teachers before and after ratings on the Connors Rating Scale. These results found will be discussed separately below.

5.3.1 Change in attention pre and post intervention

For the variable attention the results showed that there was no statistically significant change in the attention of the participants following the experiment and there was also no observable clinically significant change. There was no change in results on the screening for ADHD on both hyperactive and combined subtests. This was not unexpected as it was never considered that the implementation of a wedge cushion was a “cure” to these disorders and thus no change was expected within these areas. The areas of inattention did not indicate any change but a small clinical effect in the reduction of hyperactive behaviour of the children was noted. The inability of children

with ADHD to adequately attend and engage with the teacher is influenced by hyperactive behaviours which result in constant movement (Perold, et al., 2010; Ahmed, et al., 2014; Abdullah, et al., 2019; Pfeiffer, et al., 2008). This hyperactivity results in a constant need to move. Some studies suggested that this is linked to inattention as the children are distracted by the movement seeking behaviour (Adams & Kumar, 2019). This small reduction in hyperactive behaviour may have resulted from the placing of the wedge cushion on the participant's chairs thus allowing or encouraging the child to move within the confines of their chair. This prevents them from getting up and walking around which many teachers perceive as inappropriate behaviour (Adams & Kumar, 2019). In this study, this small reduction in hyperactivity maybe due to the child receiving additional vestibular information from the seated wedge, which allowed for regulation of the arousal system while sitting on the seated wedge. This decreased the need to seek movement out of the chair, as seen in hyperactive children who are reported to be constantly on the go (Munks, 2013; Schilling, et al., 2003; Kratenova, et al., 2007; Pfeiffer, et al., 2008). Thus, teachers may have considered children to have demonstrated less hyperactive behaviour due to the vestibular input from the seated wedge on the chair.

It could also be debated whether the hyperactivity subtest actually gave an accurate measure of attention or if these observations were actually more a measure of behaviour in relation to attention. In this study, it was determined that inattention as well as hyperactivity and learning/executive functioning as described by the Connor's Rating Scale all fell within observations which gave information relating to attention. However, on further inspection, one could perhaps consider that hyperactivity is in fact a behaviour similar to fidgeting which would be considered an on-task behaviour as described in a study by Pfeiffer (2008) (Pfeiffer, et al., 2008). In the results of on-task behaviour, fidgeting was an observation which was also shown to have a small clinical effect size and thus clear differentiation between these two observations should be considered in the future. The two-week time period of the intervention should also be considered. In other similar studies the time period of intervention varied between five days and 12 weeks (Bagatell, et al., 2010; Fedewa & Erwin, 2011; Pfeiffer, et al., 2011; Schilling, et al., 2003) the shorter studies did note that the length of the study may be a limiting factor and that longer intervention time should be considered for future studies. It is clear however, that with hindsight the time period for behaviour change

was not considered and thus may have impacted on significant changes as more time may be required for behaviour changes to occur which was also determined in previous studies (Pfeiffer, et al., 2008; Bagatell, et al., 2010). Over-all it can thus be determined that in terms of attention as a single variable in this study, there was no significant change seen as a result of the use of the seating wedge.

5.3.2 Change in posture pre and post intervention

The Chailey Levels of Ability were used to determine changes in posture with the use of the seating wedge. The results show multiple changes in the posture of the participants with the most significant statistical changes (p=0.05) being the loadbearing and pelvis position. Children are required to maintain in a seated position within the classroom for long periods of time. Their ability to maintain these positions can influence their ability to maintain arousal levels and promote improved academic performance (Umeda & Deitz, 2011; Fedewa & Erwin, 2011; Murphy, et al., 2016; Schilling, et al., 2003; Umeda & Deitz, 2011; Bagatell, et al., 2010). The optimal position for seating is considered to have the pelvis at an anterior pelvic tilt with the buttocks bearing the load of weight evenly on the base of the chair (Neville, 2005). The results of this study show that the participants had a statistically significance improvement in their pelvic p=0.009 and loadbearing positions p =0.000. Clinical significance also depicted a large effect size where Cohens r depicted at 0.60 for loadbearing and a moderate clinical effect where Cohens r depicted 0.47 for pelvic position. This indicates that there was a notable improvement in posture when using the seated wedge.

The seating wedge inclines the pelvis posteriorly which raised the pelvis into an anterior pelvic tilt and it is likely that the studs of the cushion provided added sensory input of a tactile as well as vestibular and proprioceptive nature to allow for improved loadbearing of the buttocks and thus improved the loadbearing position (Neville, 2005; Umeda & Deitz, 2011). Other improved positions reported include the shoulder girdle which showed a small clinical effect size with Cohens r 0.23, spinal position which showed a small clinical effect size with Cohens r 0.16 and trunk position with a small effect size where Cohens r is 0.18. These results demonstrated that the seating wedge facilitated a better posture across the majority of body structures and overall improved seating position. The connection between the spine and pelvis allowed for an improved

spinal position when the position of the pelvis is improved and so it follows that based on clinical reasoning that an improved spinal position would occur with the improved pelvic position (Lee, et al., 2018). Thus, the seating wedge places the pelvis into a more appropriate position and thus influences the position of the spine positively. This correlates with findings from other studies which also identified improved posture with the use of the seating wedge (Umeda & Deitz, 2011; Bagatell, et al., 2010; Fedewa & Erwin, 2011; Murphy, et al., 2016; Schilling, et al., 2003). These studies found that improving the seated position of children up until the age of seven years promotes improved postural alignment as well as in terms of over-all improvements in the postural position. The results of this study also showed an over-all improvement of postural control as determined by the “Total Chailey” score which reported a large effect size of Cohens r= 0.52. This finding that the wedge cushion improved postural control in the participants of the study demonstrates that is a useful and beneficial adaptive device within the classroom for this reason.

The only position which did not demonstrate significant results was the chin position. The position of the chin was not directly influenced by the addition of the seated wedge on the participants’ chairs. This may be due to the fact that effective support of the chin and neck requires effective cervical muscle activation (Falla, et al., 2007). In children with poor postural endurance, this muscle activation may be impaired. When this occurs, the neck automatically moves into a more forward position with the chin poking and this can occur unconsciously during a task which requires attention. This results in energy expenditure and fatigue and thus the participant lacks contraction of the deep cervical muscles (Falla, et al., 2007) impacting on the chin position. While the seating wedge did improve the over-all posture of the participants it was perhaps not enough to influence the deep cervical muscle while engaged in a task, thus affecting the position of the chin. which then did not demonstrate improved position. A study by (Falla, et al., 2007) recommended a specific exercise programme to strengthen the cervical musculature in order to improve the position of the chin through improved strength and endurance (Falla, et al., 2007). This can be considered in future studies.

5.3.3 Change in on-task behaviour pre and post intervention

The change in on-task behaviour was measured using comparison of pre-and post-intervention scores of the modified Daily Behaviour Checklist. Movement, as the use of the wedge cushion has been shown to improve on-task behaviours and increase academic participation in a number of studies (Mahar, et al., 2006; Morrison, 2014; Lantz, et al., 2007; Adams & Kumar, 2019). Statistically significant changes were observed in the participants' distractibility, both internally (p=0.025) and externally (p=0.002) in this study. The ability to remain attentive to incoming stimuli is one on-task behaviour which is important for academic participation in the classroom (Mahar, et al., 2006). Internal and external distractibility will thus hamper the child from actively engaging and attending to incoming target stimuli. This study suggests that children seated on the wedge cushion are more likely to attend and thus remain on-task as they are less internally and externally distracted. These findings are supported by the literature which determined that improved arousal levels are seen in children with ADHD who were provided the opportunity for additional movement while seated (Schilling, et al., 2003; Pfeiffer, et al., 2008; Mahar, et al., 2006). Arousal levels are dictated by sensory modulation and movement aids in improving the sensory modulation of the child (Pfeiffer, et al., 2008). Improved arousal results in less distraction, both externally and internally, as the child is no longer distracted by their need to seek movement (Schilling, et al., 2003; Pfeiffer, et al., 2011). Previous studies have also shown improvements in organisational behaviours (Pfeiffer, et al., 2008; Schilling, et al., 2003) which identified improved capacity for planning and organising written work, in children who averaged eight years of age. This is consistent with the findings of this study which reported a statistically significant (p=0.029) reduction of disorganised behaviour of the participants as well as large clinical effects (where Cohens r= 0.39) in the reduction of the disorganised behaviour of the participants. There have also been an number of publications which support the finding of improved on-task behaviour as a whole while using seated cushions, but few specify the specific on-task behaviours which may be influenced (Adams & Kumar, 2019; Bagatell, et al., 2010; Pfeiffer, et al., 2008; Schilling, et al., 2003; Fedewa & Erwin, 2011). In this study, medium and small clinical effects were observed in specific on-task behaviours of task completion (Cohens r= 0.33) and speaking out of turn (Cohens r= 0.27), reduction of movement seeking behaviour (where Cohens r= 0.20), getting down to work (Cohens

r= 0.29), motivation (0.10), fidgeting (0.18) and impulse control (0.15). These observations show that although the seating wedge does impact on on-task behaviour as a whole, the greatest areas of influence appear to be in that of distractibility and organisation of work. Considering other literature, it is believed that the influence of the sensory system, while using the seating wedge, particularly the arousal and modulation functions of the sensory system, may play a large role in these improvements. It would be interesting for further research to explore the relationship between the sensory system and the attention system may add insight into the role the seating wedge may play in these areas. Over-all there were definite positive impacts reported on on-task behaviour when making use of the seating wedge in children with ADHD. These impacts are greatest in improving distractible behaviour but do have an influence on other on-task behaviours as well.

5.4. THE CHANGE IN ATTENTION, POSTURE AND ON TASK BEHAVIOUR AFTER USING A SEATING WEDGE, COMPARED TO POPULATION MEANS

In addition to analysing the statistical changes of attention, posture and on-task behaviour, this study also looked at any changes compared to population means in order to gain clarity into whether the seating wedge had an impact on the participants functioning compared to the population of children with no additional diagnosis in mainstream schools who would score “normally” on the tests used. The results of this aspect of the study that addressed objective 2 are discussed below.

5.4.1 Change in attention pre and post intervention according to population means

The mean scores of the Connors Rating Scale were analysed compared to population means for each subtest. The participants in this study presented with mean scores in the normal population range for executive functioning indicating that on average the participants did not have any identified dysfunction in the area of executive functioning prior to starting the study. This result was unexpected because children with ADHD typically present with executive function deficits such as poor self-restraint or an inability to make use of cognitive maintenance of attention (Mahone & Schneider, 2012). One possible reason for this observation may be due to the fact that within the particular chosen LSEN environment children naturally have poor executive functioning skills and compensations for poor problem solving, metacognition and

working memory have been implemented through low expectations of these skills in the grade one classes. Teachers in these grades may have indicated that no problem exists, due to inadequate training in using the Connors Rating Scale. Teachers in this research setting often complete the Conner's Rating Scale for doctors' visits and so it was assumed that they had sufficient knowledge and experience in using the scale. However, this may need to be revaluated in future studies and additional training should be provided in order to ensure consistency of observation.

Scores for inattention, hyperactivity and learning were all below the population mean of 60 prior to the experiment, indicating that the participants presented with deficits in these areas. Children with ADHD present with poor concentration, high activity levels and poor academic performance and learning difficulties are often prevalent, these means are also consistent with the DSM-V criteria (Harpin, 2005; Lola, et al., 2019; Abdullah, et al., 2019; Mikami, et al., 2010). Studies on children with ADHD all support the findings that the majority with this diagnosis have deficits in these areas and children with ADHD will often receive prescription medication in order to address these symptoms. The majority of participants were taking medication and were reported to be stable on it at the time of the study, yet they still displayed poor on-task behaviours, attention and posture. Thus, changes in the post experiment scores are more likely to be as a result of the implementation of the seating wedge. Results showed a decrease in the mean scores for inattention, hyperactivity as well as learning problems. This suggests that the use of the seating wedge enabled some improvement these areas of dysfunction during the course of the experiment relative to the population means. Despite the lack of convincing statistical evidence of change as described above, there was a clear change within the sample compared to population means over the study period indicating individual improvements among the participants. These results support additional findings that the seating wedge does improve attention, particularly on testing with the Connors Rating Scale which was used in this study (Bagatell, et al., 2010; Pfeiffer, et al., 2008; Fedewa & Erwin, 2011). This shows that seating wedges are a valuable asset within the classroom in order to improve the attention, decrease hyperactivity and improve academic performance within the LSEN class. These results show that it does not matter if the child is taking medication at the time, the benefits of implementation of the seating wedge, to attention are advantageous when compared to population means.

5.4.2 Change in posture pre and post intervention according to population means

According to the Modified Chailey Levels of Ability normal scores are considered a score of 7 within the general population of children in mainstream schools. The data obtained indicates that significant changes were observed in the posture of the children when making use of the seating wedge, particularly at the pelvis. This correlates with research which suggests that sitting on a surface which is tilted forward will elicit a more upright position (Kim et al., 2014). Children were able to position themselves on the chair and seating wedge and there was no reported hip pathology by either the teachers of parents and so hip position of all children was assumed to be normal prior to the experiment.

The results still show informative clinical changes compared to population means. In the area of loadbearing, it was clear that all participants improved their scores relative to the population means of the Chailey level of ability. It is likely that the additional tactile and vestibular input provided by the seating wedge, assisted in keeping the children adequately positioned on the seating wedge on the chair, (Pfeiffer, et al., 2008). Improved spinal position scores closer to what would be considered the highest rating and thus a “normal” score on the Chailey Level of Ability was also observed. A study by Caldani et.al (2019) reported on poor postural stability in children with ADHD who had a particularly difficulty with fixation and increased body sway. The results of this study concur with their findings in that prior to the intervention, participants presented with poor shoulder and spinal position (Caldani, et al., 2019) as it was likely their inability to maintain a stable posture resulted in their seeking of external support resulting in ineffective postures pre-experiment. With the implementation of the seating wedge the participants were given additional support thus improving their ability to maintain the seated position more efficiently. Over-all, supporting previous research, the findings indicate improved postural control when compared to the general population of children in mainstream schools as determined by a rating of 7 on The Chailey levels of Ability, particularly at the pelvis and loadbearing positions (Murphy, et al., 2016; Pfeiffer, et al., 2008).

5.4.3 Change in on-task behaviour pre and post intervention according to population means

The Daily Behaviour Assessment Checklist was used to determine the change in on-task behaviour according to what would be considered “normal behaviour” in the general population of children at mainstream schools. The expectation was that fewer off-task behaviours observed, the more on-task the participant remained, which is the expected normal behaviour of children in the classroom. Three behaviours, particularly internal distraction, movement seeking and speaking-out-o-turn, were observed to increase from pre- to post-intervention indicating that the participants became more internally distracted, spoke out-of-turn more frequently and also presented with an increase in movement seeking behaviour. It is likely that an increase in movement seeking was observed because the participants may have been moving more on the seating wedge, as it provided an increased opportunity to move as the wedge is inflated and they are able to bounce and move around on it. This observation was also made in a previous study using stability balls instead of wedges where teachers reported increased movement seeking behaviour such as bouncing on the balls (Fedewa & Erwin, 2011). This movement seeking behaviour has been postulated to allow an improved arousal level and thus better attention as seen above where attention had improved compared to the population of children at mainstream schools (Fedewa & Erwin, 2011; Pfeiffer, et al., 2008). The study by Fedewa & Erin (2011) reported that teachers initially perceived that the stability balls would be distracting to the students as they were bouncing however, it was later determined that this was not the case. This led the researcher to question that the reported increase in internal distraction may be a fault with the scoring, where the additional movement on the wedge cushion was considered a behaviour of internal distractibility as opposed to movement seeking. This would imply some error in tester validity and would need to be further considered when replicating the study. Participants over-all demonstrated better on-task behaviour post experiment however improvements were noted through a reduction of the following behaviours: participants were reported to be less impulsive, faster to complete tasks, better able to get down to work, more organised, less disruptive, less fidgety, more motivated and less externally distracted. This is consistent with other studies which observed participants improving on-task behaviour with the incorporation of either stability balls or disc ‘o’ sit cushions in the classroom (Pfeiffer, et al., 2008; Fedewa & Erwin, 2011). These findings also support the notion

that movement influences the ability to remain on-task and that children who are provided with movement breaks within the classroom can benefit from decreased fidgeting and better over-all on-task behaviours

5.5. THE CORRELATION BETWEEN ATTENTION AND POSTURE TO ON-TASK BEHAVIOUR AFTER USING A SEATING WEDGE

5.5.1 Correlation between attention and on task behaviour

A moderate positive correlation was identified between learning problems/executive functioning problems (combined) and speed of task completion (r=0.50). This suggests that as the speed of the task improves, improvement is also observed in the learning problems/executive skills combined. It was observed that when using the seated wedge, participants were able to work faster and as participants worked faster. they demonstrated less obvious learning problems/combined executive functioning problems. Other attentional processes identified were specific learning problems which presented with a negative correlation to speaking-out-of-turn (r=0.54). This means that, the more a child speaks out-of-turn the less prominent his learning problems appear. An article by Garton, S (2012) suggested that the more engaged the child is within the classroom, the more he will try to participate (Garton, 2012). This may suggest that the negative correlation of speaking-out-of-turn and learning problems may be that as the child sits on the seating wedge, he begins to engage more in the classroom environment due to less distractibility and hyperactivity. This improved engagement allows him to better participate within the classroom environment. However, due to poorly developed social norms he begins to speak-out-of-turn in excitement, further literature on this topic is needed in order to make conclusive statements regarding this hypothesis, however no adequate studies could be found. This indicates that further research into the areas of social norms and on-task behaviours may be required to further understand the reasoning behind this negative correlation.

When considering attention based on the over-all Connors Rating Scale scores, there was a moderate negative correlation between the over-all changes and movement seeking behaviour (r=0.50). This suggests that with an increase in movement seeking behaviour, the over-all Connors scores improved. This implies that the more the participants moved, the better their attention became. This concurs with previous

studies which indicate that movement breaks within the classroom are beneficial to a child's concentration (Adams & Kumar, 2019; Lantz, et al., 2007; Morrison, 2014; Mahar, et al., 2006). These findings further support that incorporating the seating wedge within the classroom is beneficial. The research suggests that the movement provided by the seating wedge has a positive impact the over-all attentional abilities of the child and will therefore have a positive impact on classroom participation as a whole.

5.5.2 Correlation between posture and on task behaviour

The correlations between the total changes of the Chailey Levels of Ability, and the Daily Behavioural Assessment checklist gives an indication as to whether there is an association between the change in posture as determined by the Chailey Levels of Ability and the on-task behaviour as determined by the Daily Behavioural Checklist. The resulting correlation post-testing was r=0.10 which shows that there is no strong correlation between these variables. This suggests that posture does not impact on the on-task behaviour, however, when analysing each component separately it is still clear that although the posture does not impact the on-task behaviour directly, posture as an isolated variable has been shown to improve with the use of the seating wedge. This is likely due to the fact that the wedge cushion influences the vestibular and proprioceptive input of the child as their position is dictated by the proprioceptive system which informs where the body is in space and this improved active sitting position allows for better body awareness which promoted focus. The seating wedge ultimately provides the body with additional vestibular and proprioceptive input which then improves the posture and this improvement in posture will still benefit the child in the classroom as poor posture can lead to back pain as a child gets older. It is more likely that improvements in the child's on-task behaviour are linked to additional sensory components which may not be sufficiently targeted by the seating wedge, rather than postural components and further research into these findings should be conducted.

5.6. LIMITATIONS OF THE STUDY

The study involved a fairly small sample of participants selected out of convenience, from a single site with geographical limitations. No control group was utilised but the participants acted as their own control by performing pre- and post-intervention testing.

Although there was good consistency of the demographics compared to the population, it is still important to take care when generalising the findings of the research to the population of children living with ADHD in LSEN Schools.

There is a proposal that sensory modulation may be an added component to this diagnosis which perhaps was not examined sufficiently enough during this study. Through analysing the data, it became clear that sensory processing may have a larger role to play within the utilisation of the seated wedge cushion and this may impact further findings. It may be beneficial for future research to include both children with ADHD as well as Sensory Processing Disorder within the same study.

The Connors Rating Scale was used as it is believed that this test was the most effective in determining changes in attention, however the hyperactivity item may have failed to give adequate description of attention and could be likened more to an on-task behaviour. Although teachers often complete the Conner's Rating Scale in this setting and were thus assumed to be able to effectively complete it, a lack of adequate training may have also resulted in poor results in this area and so in future studies, training in all aspects should be considered. The future research should also determine if the hyperactivity subtest of the Conner's Rating Scale fits under an umbrella term of attention or if it would be better suited as an observation of on-task behaviour instead. In this study it was determined that perhaps the statistically significant changes in hyperactivity should be considered an improvement in on-task behaviour, rather than an improvement in attention.

A study by (Falla, et al., 2007) recommends specific exercise programs to affect the cervical musculature in order to improve chin position. Future studies could consider incorporation of this aspect.

An interesting finding was the correlation between increased speaking-out-of-turn when making use of the seating wedge. More research into the social norms and engagements of children when on-task behaviour is improved would be a beneficial contribution as there was no adequate literature found on this topic. Especially when considering the improvement of on-task behaviours in children with diagnosis such as ADHD may result in enhancing inappropriate social behaviours for example speaking out of turn in this case.

5.7. CONCLUSION

Incorporation of a seating wedge into an LSEN class was used to determine if adapting the seating of children with ADHD using a seating wedge could have any effect on their on-task behaviour. Throughout this discussion, there is clear evidence that using a seating wedge does impact on-task behaviour in children with ADHD at an LSEN school. Age and gender norms were identified as being similar to population norms and all children were identified as having been diagnosed with ADHD and this was further corroborated by the findings of the Connors Rating Scale.

Objective 1 was aimed at determining whether there were any significant changes in the areas of attention, posture or on-task behaviour. The over findings determined that no statistically significant changes were observed in attention, however there were small clinical effects which showed a reduction in hyperactive behaviour. In terms of postural changes there are significant statistical findings, particularly in loadbearing and pelvis positions which improved when children made use of the seating wedge. There were also obvious clinically significant improvements indicating the over-all significant changes in posture are made when using the seating wedge. In terms of on-task behaviour, statistically significant changes, particularly in internal and external distractibility were identified and clinically significant changes were observed in the majority of the other on-task behaviours indicating that using the seating wedge does improve the on-task behaviour in ADHD children at an LSEN school.

Objective 2 was aimed at determining whether any changes in attention, posture or on-task behaviour were made in comparison to population norms. In all areas of attention, posture and on-task behaviour there were clear changes towards scores which were more in line with population norms, thus using the seating wedge in the LSEN classroom, with children who have ADHD could improve areas of attention, posture and attention so that these children have score which are closer to population norms thus improving their over-all academic participation and achievement.

Objective 3 was aimed at identifying whether any correlation between the variable existed particularly attention and on-task behaviour and posture and on-task behaviour. Findings show correlation between aspects of attention and aspects of on-task behaviour particularly work speed and learning, indicating that the wedge cushion improves work speed in participants and this directly correlates to their improved

learning. Another area which had interesting correlation was that of speaking-out-of-turn and learning, showing an increase in speaking out of turn lead to less learning deficits noted. This was an interesting finding, leading to the proposition that the seating wedge may contribute to better engagement which then results in fall-out of social norms such as speaking-out-of-turn. Lastly a correlation between increased movement and improved attention was identified. Indicating that the wedge cushion does in fact improve attention by increasing the movement of the child. In terms of the correlation between posture and on-task behaviour, there was no valuable insights revealed and over-all, the posture of the child appears to have no correlation to on-ask behaviours.

Overall, the benefits of implementing the seating wedge are considerable, particularly in terms of improving areas of attention, posture and on-task behaviour to population norms as well as impacting each variable in isolation. Implementing this wedge into the LSEN classroom can allow children with ADHD an opportunity to improve academic performance. A lack of correlation between posture and on-task behaviour highlights the need for additional research into additional reasons that using the wedge cushion causes changes in areas of attention, posture and task-concept. Theories around the connection of sensory processing to the seating wedge have been discussed and appear to be an area lacking in current research.

CHAPTER SIX: CONCLUSION

ADHD is a developmental disorder typically seen in children attending LSEN schools. There is very little research detailing the effects of strategies, such as environmental adaptations, used in the classrooms of these LSEN schools. One such adaptation is the seating wedge which has been reported to improve attention and posture in children with a variety of disorders. The aim of this study was to determine the effect of using a seating wedge during in-seat and on-task behaviour of children with poor posture and attention difficulties attending an LSEN school. Three objectives guided this study in order to determine if using a seating wedge influences the on-task behaviour in children with attention and postural deficits at an LSEN school. These objectives were:

- To determine the change on posture, attention and on-task behaviour when using a seating wedge with children in the classroom at an LSEN school.
- To compare the pre- and post-test scores for posture and attention and on-task behaviour to population norms when using a seating wedge in the classroom, in children at a LSEN school.
- To determine the association between the changes in posture, attention and on-task behaviour before and after intervention using a seating wedge in the classroom in children at a LSEN school.

6.1 SUMMARY OF THE MAIN FINDINGS:

Only small clinical effects were observed with regards to the hyperactivity component of attention and over-all there were no statistically significant changes in attention. There were however statistically significant effects noted when looking at the changes in posture, which showed statistically significant improvements in posture relating to loadbearing as well as pelvic positions. as well as moderately clinically significant improvements in all other positions except the chin position These improvements would improve postural alignment which then also facilitates more appropriate postural control and promotes lessening risks of developing back pain as the child gets older (Kratenova, et al., 2007).

The seated wedge when used in the LSEN class with ADHD children showed statistically significant improvements on internal and external distractibility and improved organisation and planning. Moderate and small clinical effects were also identified in all other on-task behaviours indicating that the seating wedge improved on-task behaviours in ADHD children at an LSEN school. These improvements can assist with more effective academic participation and outcomes.

When comparing the variables of attention, posture and on-task behaviour to population means, there was a clear improvement in all three variables. Showing that the use of a seated wedge had impacts on attention, posture and on-task behaviour positively in comparison to population means. Areas of attention which were normalised to population means were inattention, hyperactivity and learning problems. The postural areas of loadbearing and spinal position also improved to the population means and all on-task behaviours except internal distraction, movement seeking and speaking out of turn improved to the population mean.

When correlating attention and on-task behaviours, there were specific correlations which were identified as having statistical significance. A negative correlation occurred between learning problems and speaking-out-of-turn, indicating that there may be an inclination for certain inappropriate social behaviours to present more overtly in ADHD children with improved engagement. Positive correlations existed between work-speed and learning as well as movement and attention. Indicating that when using the seated wedge, children who increased movement were better able to attend to information, and children who worked faster improved their learning. Posture did not show any correlation to on-task behaviour indicating although the posture is improved on children using the seating wedge, it is the attention improvement which causes the effects in on-task behaviour.

6.2 IMPLICATIONS OF THESE IN PRACTICE AND RECOMMENDATIONS

Introducing the seated wedge into the LSEN classroom can positively impact the children with ADHD who may have difficulty remaining on-task due to poor attention. This improvement in attention can have positive impacts on academic performance. Introducing the wedge cushion will also positively impact those children who present with poor posture as it will improve the postural alignment, and although this may not

impact on on-task behaviour as a result. However, studies have indicated that reducing the risk of back pain development is a positive result of improved posture in children (Kratenova, et al., 2007).

6.3 RECOMMENDATIONS FOR FURTHER RESEARCH,

Further research is necessary using a larger sample size and the intervention length should be increased to at least 12 weeks as some other studies displayed more success with a longer period of intervention (Fedewa & Erwin, 2011). Disorders such as sensory processing disorder should be further considered when looking into the reasons for significant improvements in attention and posture when using the seated wedge, particularly in children with ADHD who may have undiagnosed sensory processing deficits in addition to ADHD. It appears as though sensory processing may have a large role in the changes observed and further exploration of the sensory processing deficits and mechanism in these areas may give clarity into the reasoning for improvements in posture in this study.

The Chailey's level of ability was designed to observe a change in postural control in children with cerebral palsy and despite being adapted by Bennie (2011) it is clear that further modifications of the scoring of the Chailey's level of ability are needed. One example would be excluding the section for 'positioning self on chair' in for future studies with normal children

Chin position in this study was shown not to demonstrate any significant results and further research into chin position and possible exercise programs may allow one to gain more clarity into whether cervical muscular strengthening along with the use of the seated wedge may make a difference in posture.

Over-all more research into the use of seated wedges in the classroom and their impacts thereof would be beneficial in gaining support to motivate for the addition of these adaptive devices in the classroom.

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APPENDICES:

APPENDIX A: Approval from the faculty of health sciences graduate studies committee, ethical clearance from the committee for research on human participants at the university of the Witwatersrand M160950

R14/49 Miss Tara-li Wellmann

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M160950

NAME: (Principal Investigator)	Miss Tara-li Wellmann
DEPARTMENT:	Occupational Therapy The School of Achievement/Prestasi Skool, Germiston
PROJECT TITLE:	The Effect of a Seating Wedge on On-Task Behaviour, in Children Attending a School for Learners with Special Education Needs
DATE CONSIDERED:	30/09/2016
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	P.A De Witt
APPROVED BY:	Professor P Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	06/02/2017

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 301, Third Floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed in September and will therefore be due in the month of September each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature Date

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX B: Permission to conduct the study from the Gauteng Department of Basic Education

For administrative use only:
Reference no: D2017 / 370

GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GDE RESEARCH APPROVAL LETTER

Date:	28 November 2016
Validity of Research Approval:	6 February 2017 to 29 September 2017
Name of Researcher:	Wellmann T.
Address of Researcher:	54 Holly Street; Van Dyk Park; Boksburg; 1459
Telephone / Fax Number/s:	074 823 4321
Email address:	tarawellmann@gmail.com
Research Topic:	The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Needs.
Number and type of schools:	ONE LSEN School
District/s/HO	Ekurhuleni South

Re: Approval in Respect of Request to Conduct Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved. A separate copy of this letter must be presented to the Principal, SGB and the relevant District/Head Office Senior Manager confirming that permission has been granted for the research to be conducted. However participation is VOLUNTARY.

The following conditions apply to GDE research. The researcher has agreed to and may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted:

CONDITIONS FOR CONDUCTING RESEARCH IN GDE

1. *The District/Head Office Senior Manager/s concerned, the Principal/s and the chairperson/s of the School Governing Body (SGB.) must be presented with a copy of this letter.*
2. *The Researcher will make every effort to obtain the goodwill and co-operation of the GDE District officials, principals, SGBs, teachers, parents and learners involved. Participation is voluntary and additional remuneration will not be paid;*

2016/11/29

Making education a societal priority

Office of the Director: Education Research and Knowledge Management ER&KM)
9th Floor, 111 Commissioner Street, Johannesburg, 2001
P.O. Box 7710, Johannesburg, 2000 Tel: (011) 355 0506
Email: David.Makhado@gauteng.gov.za
Website: www.education.gpg.gov.za

APPENDIX C: Permission from the principal of the School of Achievement in Germiston

Permission:

I TINUS DE KLERK, (principal of the School of Achievement/Prestasi Skool), allow Tara-li Wellmann to conduct her research in the study titled: *The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Education Needs* at the School of Achievement. I have read and understood all the information related to the study in the information letter provided.

Signature: _____ Date: 12/01/2017

Researcher's Signature: _____ Date: 12/01/2017

APPENDIX D: Information letter for parents

Occ
Scho
Tel: +

INFORMATION DOCUMENT

Study title:
The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Education Needs

Hello, my name is Tara-li Wellmann, I am an occupational therapist, currently completing my master's degree at the University of the Witwatersrand. In order to complete my degree, I am required to complete a research project. I am doing my doing research on attention in children. I would like to see if sitting on a wedge cushion in the classroom helps children to focus better and pay attention to a specific task for longer (on-task).

I am asking for your permission to include your child in this research study.

If you decide to allow your child to participate in this study, he or she will be given a wedge cushion to sit on in the classroom for two weeks. His teacher will answer some questions about his ability to remain on-task before using the cushion and also during the use of the cushion. As you know the school records the classroom environment using a video recorder within the classrooms, for the safety of all children in the classroom.

With your permission I would analyze a 10-minute excerpt of video footage of your child. This would be done using a checklist which gives us information about the ability to remain focused on a task. We will also use a photograph to determine if your child showed any posture changes which can also impact on attention and focus. We can then determine if sitting on the cushion had an impact on your child's ability to remain focused on a task and we can see if it had anything to do with an improvement in their posture.

You would be required to fill out a short questionnaire before taking part in the study to ensure that your child qualifies to be a part of the study. (Children who are currently suffering from ear infections cannot take part in this study as it may have an impact on their ability to tolerate sitting on the cushion). Although there have not been any risks associated with the use of the wedge cushion, your child will be monitored by his/her teacher for the duration of the study, which is 2 weeks.

All the grade 2 children at "The School of Achievement/Prestasi Skool will be invited to participate.

By participating in this study it will be possible to determine if using these wedge cushions should be implemented more frequently in the classroom. It also benefits your child as a participant by identifying whether, your child demonstrated significant improvements in the classroom. If significant improvements on the wedge cushion is shown, then your child's

occupational therapist will be notified in order to provide them with a wedge cushion once the study is complete.

You will also be given any pertinent information about your child during the period which he/she is taking part and the outcome will be made available to you on completion of the study.

Participation is voluntary, this means that you may refuse to participate with no penalty or loss of benefits which your child is entitle to within the classroom as well as during his school based therapy. You or your child may also decide to discontinue participation at any time without penalty loss of benefits to which your child is entitled to both within the classroom as well as during school based therapy.

Confidentiality and the anonymity of each child will be ensured and every effort will be made to keep personal information confidential. After completing your questionnaire your child will be assigned a number and this will be used for all research purposes. The clinical experts may see some parts of your child's face during video analysis, however this information will be kept confidential and clinical experts will delete all video footage after scoring. There is a chance that the Research Ethics Committee will review the data analysis for quality assurance, however your child's name will be excluded from the data analysis.

For further information or reporting of study related adverse events please don't hesitate to contact me at Tarawellmann@gmail.com.

If you have any concerns or complaints, you can contact the chair and secretariats of the Wits Human Research Ethics Committee (Medical): **Chairperson**: peter.cleaton-jones1@wits.ac.za or **Administrators**: Ms Zanele Ndlovu/ Mr Rhulani Mkansi/ Mr Lebo Moeng Tel 011 717 2700/2656/1234/1252 or Email: HREC-Medical.ResearchOffice@wits.ac.za

Yours Sincerely,

Tara-li Wellmann
B.Sc.(OT) WITS

APPENDIX E: Parent consent forms

Consent:

I _____, parent or legal guardian of _____, hereby consent to the participation of the above mentioned child in the research conducted by Tara-li Wellmann, in the study titled: *The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Education Needs*. I understand and hereby consent to having video footage of the above mentioned child, as provided by the school, used in the analysis process described above.

I have read and understood all of the provided information related to the study in the information letter and hereby agree to the terms.

Signature:	_____	Date:	_____
Printed name of parent or guardian	_____	Phone number	_____
Researcher's Signature:	_____	Date:	_____

If you have any concerns or complaints, you can contact the chair and secretariats of the Wits Human Research Ethics Committee (Medical): **Chairperson**: peter.cleaton-jones1@wits.ac.za or **Administrators**: Ms Zanele Ndlovu/ Mr Rhulani Mkansi/ Mr Lebo Moeng Tel 011 717 2700/2656/1234/1252 or Email: HREC-Medical.ResearchOffice@wits.ac.za □

APPENDIX F: Information letters for teachers

INFORMATION DOCUMENT

Study title:
The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Education Needs

Hello, my name is Tara-li Wellmann, I am an occupational therapist, currently completing my master's degree at the University of the Witwatersrand. In order to complete my degree, I am required to conduct a research project. I am doing my doing research on attention in children. I would like to see if sitting on a wedge cushion in the classroom helps children to focus better and pay attention to a specific task for longer (on-task).

If you decide to participate in this study, the children in your class (whose parents have given consent) will be given a wedge cushion to sit on in the classroom for two weeks. You will be required to fill out a short questionnaire on each child's ability to remain on-task before using the cushion and after using the cushion.

All the grade 2 teachers at "The School of Achievement/Prestasi Skool" will be approached.

By participating in this study it will be possible to determine if using these wedge cushions should be implemented more frequently in the classroom. If it makes significant improvements in the children's ability to remain on-task it may aid teaching children who have attentional difficulties.

The results of the study will be available to you after completion of the study.

Participation is voluntary, this means that you may refuse to participate with no penalty or loss of benefits which you are entitled to. You may also decide to discontinue participation at any time without penalty or loss of benefits which you are entitled to.

Confidentiality will be ensured and your name will never be revealed during the research process.

For further information or reporting of study related adverse events please don't hesitate to contact me at Tarawellmann@gmail.com

If you have any concerns or complaints, you can contact the chair and secretariats of the Wits Human Research Ethics Committee (Medical): Chairperson: peter.cleaton-jones1@wits.ac.za or Administrators: Ms Zanele Ndlovu/ Mr Rhulani Mkansi/ Mr Lebo Moeng Tel 011 717 2700/2656/1234/1252 or Email: HREC-Medical.ResearchOffice@wits.ac.za

Yours Sincerely,

Tara-li Wellmann (B.Sc.(OT) WITS)

APPENDIX G: Teacher consent forms

Consent:

I _____, hereby consent to participation in the research conducted by Tara-li Wellmann, in the study titled: *The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Education Needs* in my classroom at the School of Achievement.

I have read and understood all the information related to the study in the information letter provided.

Signature: _____ Date: _____

Researcher's Signature: _____ Date: _____

APPENDIX H: Demographic questionnaires

DEMOGRAPHIC QUESTIONAIRE

Child's Name: _____
Date of Birth: _____
Parents Name: _____
Contact Details: _____

Has your child attended private occupational therapy outside of school? (Circle)

Yes No Unsure

Is your child **currently** suffering from any ear infection or any other ear related problems?

Yes, No Unsure

Does your child display and inability to participate in homework activities effectively in terms of attention?
Yes, No Unsure

Does your child have difficulty with participate in classroom activities effectively in terms of attention and completion of tasks?

Yes, No Unsure

Has your child ever been described as having low muscle tone?

Yes, No Unsure

Has your child ever been described as having poor posture?

Yes, No Unsure

Is your child currently taking any medication?

Yes, No Unsure

If yes, please indicate the type and dosage of medication;
Name_____Dosage_____
Name_____Dosage_____
Name_____Dosage_____

Thank you for taking the time to complete this questionnaire

APPENDIX I: Connors Rating Scale

CONNERS 3rd – Teacher

C. Keith Conners, Ph.D

In the past month, this was...	0 = Not true at all (Never, Seldom) 1 = Just a little true (Occasionally)	2 = Pretty much true (Often, Quite a bit) 3 = Very much true (Very often, Very frequently)

1. Leaves seat when he/she should stay seated.	0	1	2	3
2. Gets overly excited.	0	1	2	3
3. Has a short attention span.	0	1	2	3
4. Fidgets or squirms in seat.	0	1	2	3
5. Cannot do things right.	0	1	2	3
6. Begins a task or project without making a plan.	0	1	2	3
7. Restless or overactive.	0	1	2	3
8. Threatens to hurt others.	0	1	2	3
9. Blurts out answers before the question has been completed.	0	1	2	3
10. Intentionally damages or destroys things that belong to others.	0	1	2	3
11. Has trouble getting started on tasks or projects.	0	1	2	3
12. Does not remember what he/she reads.	0	1	2	3
13. Excitable, impulsive.	0	1	2	3
14. Uses a weapon (e.g., a bat, brick, broken bottle, knife, or gun).	0	1	2	3
15. Is patient and content, even when waiting in a long line.	0	1	2	3
16. Cannot decide which things are the most important.	0	1	2	3
17. Acts as if driven by a motor.	0	1	2	3
18. Forgets instructions quickly.	0	1	2	3
19. Has trouble keeping friends.	0	1	2	3
20. Completes projects at the last minute.	0	1	2	3
21. Is cruel to animals.	0	1	2	3
22. Temper outbursts; explosive, unpredictable behavior.	0	1	2	3
23. Is easily distracted by sights or sounds.	0	1	2	3
24. Runs or climbs when he/she is not supposed to.	0	1	2	3
25. Fails to finish things he/she starts.	0	1	2	3
26. Talks out of turn.	0	1	2	3
27. Steals while confronting a person (e.g., mugging, purse snatching, or armed robbery).	0	1	2	3
28. Is perfect in every way.	0	1	2	3
29. Interrupts others (e.g., butts into conversations or games).	0	1	2	3
30. Has to struggle to complete hard tasks.	0	1	2	3
31. Steals secretly (e.g., shoplifting or forgery).	0	1	2	3
32. Is noisy and loud when playing or using free time.	0	1	2	3
33. Has forced someone into sexual activity.	0	1	2	3
34. Has no friends.	0	1	2	3
35. Physically hurts people.	0	1	2	3
36. Makes mistakes.	0	1	2	3
37. Doesn't pay attention to details; makes careless mistakes.	0	1	2	3
38. Is angry and resentful.	0	1	2	3
39. Gets over-stimulated or "wound up."	0	1	2	3
40. Lies to avoid having to do something or to get things.	0	1	2	3
41. Gives up easily on difficult tasks.	0	1	2	3
42. Appears to be unaccepted by group.	0	1	2	3
43. Is cold-hearted and cruel.	0	1	2	3
44. Is sidetracked easily.	0	1	2	3
45. Spelling is poor.	0	1	2	3
46. Mood changes quickly and drastically.	0	1	2	3
47. Argues with adults.	0	1	2	3
48. Disturbs other children.	0	1	2	3
49. Is sad, gloomy, or irritable for many days at a time.	0	1	2	3
50. Talks too much.	0	1	2	3
51. Tries to get even with people.	0	1	2	3
52. Has trouble with reading.	0	1	2	3
53. Has lost interest or pleasure in activities.	0	1	2	3
54. Skips classes.	0	1	2	3
55. Tells the truth; does not even tell "little white lies."	0	1	2	3
56. Is irritable and easily annoyed by others.	0	1	2	3
57. Fails to complete schoolwork or tasks (even when he/she understands and is trying to cooperate).	0	1	2	3
58. Becomes irritable when anxious.	0	1	2	3
59. Annoys other people on purpose.	0	1	2	3
60. Avoids or dislikes things that take a lot of effort and are not fun.	0	1	2	3
61. Has intentionally set fires for the purpose of causing damage.	0	1	2	3
62. Loses temper.	0	1	2	3
63. Does not understand what he/she reads.	0	1	2	3

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APPENDIX J: Daily Behaviour Assessment Scale

DAILY BEHAVIOUR ASSESSMENT SCALE

Please tick off the most significant observable behaviours needed during deskwork and rate these in the final column.

Item					F
Concentration and Attention					
1. Easily distracted by own thoughts, daydreams					
2. Easily distracted by external stimuli (noise and things he sees)					
3. Appears to be bored, lacks motivation					
Behaviour in Class					
4. Restless, overactive, fidgety					
5. Gets out of seat, needs to move around					
6. Disrupts class, disturbs others					
7. Speaks out of turn, demands to be in the spot-light					
Perseverance and Task Completion					
8. Easily frustrated when attempting tasks					
9. Gives up easily and wont complete the task (fails to finish the task)					
Organisational Ability					
10. Disorganised on self, and in his work					
11. Cant get down to his work					
12. Slow to complete a task					
13. Impulsive, works too fast, work lacks planning					
Ability to Cope with New Situations					
14. Refuses to attempt new tasks					
15. Becomes over-excited, lacks self-control					
16. Lacks confidence and withdraws					
17. Cant cope with a number of different stimuli at the same time					
18. Has a low self esteem					
Social Interaction					
19. Has difficulty making friends					
20. Is not accepted by peers					
21. Isolates himself from others					
22. Is aggressive towards others					
23. Antagonises others					
24. Has poor interaction with teacher					
Responsibility, Initiative					
25. Not able to initiate activities and carry them out independently					
26. Not able to assume responsibility for his own work					
27. Not able to assume responsibility in classroom activity					
Emotional Control					
28. Temper outbursts, explosive unpredictable behaviour					
29. Labile, cries easily and often					
30. Stubborn, withdraws, sulks easily					
31. Anxious, easily embarrassed					

APPENDIX K: Chailey Levels of Ability

COMPONENT GROUP	COMPONENT	CHAILEY LEVEL OF ABILITY 1	2	3	4	5	6	7	GROUP SCORE
Ability to be positioned	Cannot be placed ☐	1							
	Placeable but not able to maintain position ☐		2						
	Able to maintain position but not move ☐			3					
	Able to maintain position and move within base ☐				4				
	Able to maintain position and move outside base ☐					5			
	Able to move out of position ☐						6		
	Able to attain position ☐							7	
Loadbearing	Buttocks ☐		2	3	4	5	6	7	
	Feet ☐		2	3	4	5	6	7	
	Posterior aspect of legs ☐			3	4	5	6	7	
Shoulder Girdle Position	Retracted ☐	1	2	(3)	(4)	(5)	(6)	(7)	
	Neutral ☐		2	3	(4)	(5)	(6)	(7)	
	Protracted ☐				4	5	6	7	
Pelvic Girdle Position	Posteriorly tilted (uncontrolled) ☐	1	2	(3)					
	Neutral ☐			3	(4)	5	6	7	
	Anteriorly tilted ☐				4	5	6	7	
	Posteriorly tilted (controlled) ☐				(4)	5	6	7	
Spinal Profile	Rounded ☐		2	3	(4)	(5)	(6)	(7)	
	Upright ☐				4	5	6	7	
Chin Position	Poked ☐	1	2	(3)	(4)	(5)	(6)	(7)	
	Tucked ☐			3	4	5	6	7	
	Retracted ☐				4	5	6	7	
Trunk Position and Movement	Behind base ☐	1							
	Forward over base ☐		2	3	4	(5)	(6)	(7)	
	Rotate trunk within base ☐				4	(5)	(6)	(7)	
	Forwards and laterally within base ☐				4	(5)	(6)	(7)	
	Forwards and laterally outside base ☐					5	6	7	
	Recovers balance from behind base ☐					5	6	7	
Hip Position	Neutral ab/adduction ☐				4	5	6	7	
	Neutral int/external rotation ☐				4	5	6	7	
Activities	Variable, uncontrolled, none ☐	1	2						
	Propping to balance ☐			3	(4)	(5)	(6)	(7)	
	Able to raise to shoulder height ☐				4	(5)	(6)	(7)	
	Able to bring hands into midline ☐				4	5	6	7	
	Able to raise above shoulder height ☐					5	6	7	
		OVERALL LEVEL OF ABILITY:							

INFORMATION DOCUMENT

Study title:
The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Education Needs

Hello, my name is Tara-li Wellmann, I am an occupational therapist, currently completing my master's degree at the University of the Witwatersrand. In order to complete my degree, I am required to conduct a research project. I am doing my doing research on attention in children. I would like to see if sitting on a wedge cushion in the classroom helps children to focus better and pay attention to a specific task for longer (on-task).

If you decide to participate in this study, you will be required to participate in training on two short assessments "The Daily Behavioral Assessment" and "The Chailey Levels of Ability" and there after score up to 60 of the participants from a video or photograph.

All the occupational therapists at "The School of Achievement/Prestasi Skool" will be approached.

By participating in this study it will be possible to determine if using these wedge cushions should be implemented more frequently in the classroom. If it makes significant improvements in the children's ability to remain on-task it may aid teaching children who have attentional difficulties.

The results of the study will be available to you after completion of the study.

Participation is voluntary, this means that you may refuse to participate with no penalty or loss of benefits which you are entitled to. You may also decide to discontinue participation at any time without penalty or loss of benefits which you are entitled to.

Confidentiality will be ensured and your name will never be revealed during the research process.

For further information or reporting of study related adverse events please don't hesitate to contact me at Tarawellmann@gmail.com

If you have any concerns or complaints, you can contact the chair and secretariats of the Wits Human Research Ethics Committee (Medical): Chairperson: peter.cleaton-jones1@wits.ac.za or Administrators: Ms Zanele Ndlovu/ Mr Rhulani Mkansi/ Mr Lebo Moeng Tel 011 717 2700/2656/1234/1252 or Email: HREC-Medical.ResearchOffice@wits.ac.za

Yours Sincerely,

Tara-li Wellmann (B.Sc.(OT) WITS)

Consent:

I _____, hereby consent to participation in the research conducted by Tara-li Wellmann, in the study titled: *The effect of a seating wedge on on-task behaviour, in children attending a school for Learners with Special Education Needs* in my classroom at the School of Achievement.

I have read and understood all the information related to the study in the information letter provided.

Signature: _____ Date: _____

Researcher's Signature: _____ Date: _____

APPENDIX M: TURN IT IN REPORT

THE EFFECT OF A SEATING WEDGE ON ON-TASK BEHAVIOUR, IN CHILDREN ATTENDING A SCHOOL FOR LEARNERS WITH SPECIAL EDUCATION NEEDS

by Tara-li Wellmann

Submission date: 23-Feb-2021 10:02PM (UTC+0200)
Submission ID: 1516399422
File name: Tara-Li_Chapter_1-6.docx (243.09K)
Word count: 24533
Character count: 137010

THE EFFECT OF A SEATING WEDGE ON ON-TASK BEHAVIOUR, IN CHILDREN ATTENDING A SCHOOL FOR LEARNERS WITH SPECIAL EDUCATION NEEDS

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