EXPLORING THE INFLUENCE OF NEUROFEEDBACK TRAINING ON GRADE R LEARNERS' CONCENTRATION LEVELS FOR SCHOOL READINESS

by

Levina Catherina Bosch

((N DIP Somatology, B Tech Somatology, PGCE (Post Graduate Certificate in Education), B Ed. Honores Professional Psychology of Education, Med Psychology of Education))

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Supervisor: Prof. C. Beyers

Co-Supervisor: Dr. K.R. Mukuna

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DECLARATION

I hereby declare that *Exploring the influence of neurofeedback training on Grade R learner's concentration levels for school readiness* is my own independent work, and has not previously been submitted by me at another university/faculty. I furthermore affirm the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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L. C. Bosch (Smith) Date

ABSTRACT

The premise of this study is to explore the influence of neurofeedback training on Grade R learners' concentration levels for school readiness. In order to understand the complexity of this study, it is important to note the past inequalities and the effect of it on children, specifically on their concentration levels within the classroom and the changes it brought to where the education system is today. This background gave way to the purpose of this study to determine the influence of neurofeedback training on Grade R learners' concentration levels for school readiness, as well as to determine the experience teachers have with learners' concentration levels in school. Furthermore, I want to establish how teachers perceive neurofeedback and the implementation thereof. This will indicate if it would be possible to implement neurofeedback training into the South African educational system and to determine the support teachers need to do so. A mixed method approach was followed, whereby the research adopts an embedded convergent research design, whereby qualitative and quantitative research data are embedded in a larger design. The sampling utilizes a simple multi-stage purposeful random sample design. The first stage is a random selection and the following stage is purposive selection of participants (Onwuegbuzie & Collins, 2007). The population involved all Primary Schools from the Motheo District, in the Free State Province, South Africa, who were willing to take part in this study. The data gathered from the questionnaires was analysed by a statistician with the program called Python to the point where the data could be represented in graph form. The data from the document analysis was done, were a six (6) page report, received from the qualified occupational therapist. The data from the focus group interview was also interpreted in conjunction with the data found from the document analysis to clarify, support and strengthen the results found. Literature was also collected with regard to theories and aspects of concentration, child development, as well as neurofeedback, and the necessary inferences and conclusions drawn. Findings from the study were significant and positive in terms of the possible implementation of Brain Gain Neurofeedback training into the

South African school curriculum as well as the need, almost desperation, that were identified that exist among teachers.

LIST OF ABBREVIATIONS

AAP – American Association of Paediatrics

ADD – Attention Deficit Disorder

ADHD – Attention Deficit Hyperactive Disorder

CAPS – *National Curriculum and Assessment Policy Statement*

CDC – Centre for Disease Control and Prevention

CR – Conditioned response

CS – Conditioned stimulus

CDC – Concentration deviation coefficient

DBST – District Based Support Team

DOE – Department of Education

DHET – Department of Higher Education

ECD – Early Childhood Development

EMG – Electromyography (assess health of muscles)

EEG – Electroencephalographic

HRV – Heart Rate Variability

HEG – Hemoencephalography

IQ – Intelligence Coefficient

NEPI – National Education Policy Investigation Framework Report

OECD – Organization of Economic Co-operation and Development

RSA – Republic of South Africa

RNCS – Revised National Curriculum Statement

RCN – Raising Children Network

TESCA – Test of Emotional Stability and Cognitive Stability

UCS – Unconditioned stimulus

USA – United States of America

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CHAPTER 1: BACKGROUND AND RATIONALE OF THE STUDY

1.1. INTRODUCTION

South African society has undergone major social, economic and political changes over the past few years, as we have sought to establish a democratic and humane culture. The Minister of Education in 2001, stated in the Department of Education White Paper 5, on Early Childhood Development (ECD), that 40% of children live in dire conditions of poverty and neglect. Children raised in these conditions have a higher risk of dropouts, repetition, stunted growth, and poor adjustment in school and therefore learning difficulties and among others, concentration problems (Taylor & Yu, 2013; Dieltiens & Meny-Gibert, 2012).

Concentration problems prevalent, specifically attention deficit hyperactive disorder (ADHD) and attention deficit disorder (ADD), are affecting 2% to 16% of the school-going population (Schoeman, 2018, Catherine, Robert, Mala, Kanniammal & Arullapan, 2019 & Saline, 2021). A study done by Schoeman (2015), a South African psychiatrist, indicated that 5% of children in South Africa suffer from ADHD, whereby she states that many children in South Africa are not formally diagnosed, but are labelled as 'naughty' or 'stupid', due to a lack of knowledge in their communities. The estimate number of children diagnosed with ADHD in the United Stated of America (U.S.A.) have changed over the years according to a study done by Centre for Disease Control and Prevention, (2014); in 2003 – 7.8% of children were diagnosed with ADHD, 2007 – 9.5% and 2011 – 11%. Therefore, concentration issues are more prevalent today. In South Africa, there are limited information with regard to the prevalence of these conditions, but a recent study was done by Schoeman (2018), which looked at the mental health barriers South African school children face. This study found the prevalence of ADHD to be 2.5% of learners with 500 children being screened from 18 schools, whereby these children were in their foundation phase of schooling. They also found a very low awareness among teachers of this issue, as well as various government departments (education,

health and social development), which should have been working collaboratively, were working in silos with their own processes and procedures.

Neurofeedback is an approach for non-invasive modulation of human brain activity, in order to manage mental disorders and enhance the cognitive performance of individuals (Plerou & Vlamos, 2016). They furthermore indicated that educational neuroscience is blending scientific fields like neuroscience, cognitive sciences and education. According to these authors, educational neuroscience methods focus on accessing real-time information about the brain, in order to enhance cognitive functions like language, speech, emotion, consciousness, attention, memory, as well as other higher cognitive functions, which are involved with the use of neuroscience-based techniques. Neurofeedback is a training technique that helps individuals learn how to self-regulate brain activity using neurological feedback, provided by sensory devices (Enriquez-Geppert, Huster & Herrmann, 2017). It is regarded as a safe method whereby electrodes are placed on specific areas of the scalp. Brain activity waves are unconsciously processed and evaluated by the therapist (Plerou & Vlamos, 2016). Neurofeedback training approaches could modify brain activity differently, which is based on neurological measures. Related studies have highlighted that neurofeedback training is efficiently used in blended sciences, such as neuroscience and educational psychology in order to improve neuropsychological disorders, cognitive efficiency and enhance brain functions in healthy individuals (Wyckoff et al., 2013).

Rogel, Loomis, Hamlin, Hodgdon, Spinazzola, and van der Kolk (2020) argue that chronic early childhood exposure to neglect and abuse by caregivers has shown to have a long-lasting impact on children's mental and neural development. These developmental issues lead to problems with attention, impulse control, self-regulation, and executive functioning. This is one of the costliest public health challenges

According to the Centre for Disease Control and Prevention (CDC) (2018), the child playing, learning, speaking, acting and moving, offered important clues that could

contribute to a child's development, including social and emotional development, language/communication development, cognitive (learning, thinking, problem-solving) development and movement/physical development. Most children need to be able to reach developmental milestones by age five.

Social and emotional development

Gottschalk (2019) analysed the following section in the Organization of Economic Co-operation and Development (OECD), namely that children in the 21st century are avid users of technology, more than generations past. This has led to much attention on the consequences of technology use and the impact on children's brains, socio-emotional, cognitive, and physical development. Despite unclear correlations between technology use and child development, policy-makers worldwide are concerned with children's health. These groups advocate for partially or fully limiting screen time for children. More research is needed, as it is still in its infancy years. An example of such a group includes the American Association of Paediatrics (AAP), a prominent voice in child health.

Language and communication development

It is essential to note that language and communication are basic requirements for human interactions. Scholars highlighted a strong bridge between the brain and language and cognitive development in children (Undiyaundeye & Basake, 2018). Furthermore, Sword (2021) emphasized that speech and language development could be an important element that provided the foundation for learners to build in school. Sword (2021) indicated that children's early vocabulary is crucial for later educational outcomes. Thus, it can be concluded that the more a young brain is stimulated with appropriate experiences, the more it leads to mastering language. Language and brain development are intricately related, one nourishing the other, especially during early childhood, according to Stephens (2007).

Cognitive development

It is crucial to consider attention as an important psychological factor affecting the learners' academic achievements. However, Shah and Saleem (2015) determined whether a student's level of attention could directly affect their academic achievement. Their findings revealed that high levels of attention could influence students' academic achievements (Shah & Saleem, 2015). Drawing from the previous research, one can conform to the statement that, even if a child has the brain capacity of a genius, he/she will struggle academically if concentration is impaired (Shah & Saleem, 2015)

Physical development

Movement plays a crucial role in all aspects of the child's development - especially in pursuit of academic success. Unfortunately, childhood experiences are changing due to societies, leading to diminished outdoor play (Bento & Dias, 2017). This, in turn, leads to sedentary lifestyles and children disconnecting from the natural world. Parents and professionals alike are affected by the possible accidents that might happen during outdoor play; therefore, children tend to be kept inside and occupied with adult-controlled structured activities (Holt, Neely, Spence, Carson, Pynn, Boyd, Ingstrup & Robinson, 2016; Bento & Dias, 2017; Watchman & Spencer-Cavalier, 2017; Mullen, 2019).

According to Goodway, Ozmun and Gallahue (2021), motor development forms the basis of all the skills children will need in the classroom. Children with learning difficulties are often likely to struggle with their motor skills and may mistakenly be branded as naughty, hyperactive or lazy. The reality is that under-developed motor skills might be the real reason for learning impairments.

Pre-schoolers, who performed better on fine and gross motor skill assessments early in the school year, were more likely to have better social behaviour and "executive function," or the ability to pay attention, follow directions and stay on tasks later in the school year (MacDonald et al., 2016).

De Jager (2019) and Amod and Heafield (2013) explain the meaning of school-readiness in short, namely that a child has to be able to concentrate on a task for at least 11 minutes, even if he dislikes the activity or does not want to (e.g. building a 36-piece puzzle, drawing patterns along the edges of an A4-sheet of paper using forms(■,▲,●) or clipping pegs in a specific pattern and order); listen to instructions the first time; speak and understand language of instruction in the Grade 1 classroom fluently; and most importantly, has played outside enough to be able to sit still and is ready to master abstract, symbolic learning activities, such as writing and reading the alphabet and numbers.

MacDonald et al. (2016) furthermore state that preparing for life and school, physical activity and motor skills are vital. It is also indicated that children with strong executive function skills are more likely to be successful in kindergarten and beyond. Executive function, also known as self-regulation, includes the ability to pay attention, follow directions and persist through difficulty (MacDonald et al., 2016).
Biofeedback is a method of gaining information from the body. This could be by monitoring skin temperature, blood pressure, heart rate, brain waves and other body conditions. This is done to promote control over normally involuntary bodily processes through conditioning, also called operand conditioning and relaxation. There are various types of biofeedback like heart rate variability (HRV), muscular (EMG) and neurological (EEG or HEG), also called neurotherapy or neurobiofeedback or neurofeedback. All of these biofeedback forms employ some type of computer monitoring device along with electronic sensors to give information about what is going on in the body. Neurofeedback give feedback about specific brain activity. HEG neurofeedback measures blood blow to the prefrontal cortex. The prefrontal cortex (the area behind the forehead) is involved with executive functioning, such as attention, organisation and planning. Thus low blood flow to this area could affect concentration, relaxation, and higher-order thinking.

HEG is a neurofeedback technique that trains a person consciously to regulate blood

flow to the brain. This method focuses on controlled brain blood flow and corresponding changes (in oxygenation). With enough neurological feedback (neurofeedback provided by their Tesca HEG device) a person becomes able to consciously control an unconscious process; in this case regulating blood flow to the brain. The neurofeedback unit used in the Brain Gain Neurofeedback programme is engineered to provide with accurate information about the blood flow to certain areas of your brain.

The Brain Gain Neurofeedback Training's 2-year school readiness program is specifically formulated to ensure that a child is ready for school when entering the formal school environment in Grade 1. The aim is to let a child enter Grade 1 with confidence. The Brain Gain Neurofeedback Training objective is to address the root cause of concentration issues and not just the symptoms. (Goodway et al., 2021). A thorough literature study gives an overview of theoretical perspectives on children's concentration levels and the effect of all-encompassing development, taking the daily life and activities of Grade R learners into consideration.

1.2. STATEMENT OF THE PROBLEM AND RESEARCH QUESTIONS

Atmore, van Niekerk and Ashley-Cooper (2012) state that education is a basic human right and fundamental in building life-long learning and economic opportunities. They indicate that although South Africa has made progress since 1994, in early childhood development and Grade R provisioning, there are still significant challenges. These challenges include proper infrastructure, nutrition, a lack of properly trained early childhood teachers, transport among others, but more so developmental challenges children face daily.

Basic education refers to education from Grade R to Grade 12. Khetha (2017) explained that the South African education system consists of four phases: foundation phase: Grade R to 3; Intermediate phase: Grade 4 to 6, Senior phase: Grade 7 to 9, and Further Education and Training phase: Grade 10 to 12. Children spend one to two years in early childhood development centres, and one year in Grade RR, which is still part of

the early childhood development centre and falls under the Department of Social Development's umbrella, but changes are expected in the near future.

Grade R (kindergarten) has formed part of the foundation phase (Grade R to Grade 3) education policy since 1998 and are always attended at Primary schools. By law, children have to start attending school the year before the calendar year in which they turn seven (age of compulsory schooling). They should therefore reach Grade 1 by age seven, and spend eight years in primary school, which ends in Grade 7.

Janse van Rensburg (2015) posits clearly that, according to the current *National Curriculum and Assessment Policy Statement* (CAPS), there are certain assessment standards that should be achieved by the end of the Grade R year. Ideally this includes that a Grade 1 learner should be able to be physically, cognitively, affectively, normatively, socio-culturally and linguistically ready for a solid start to his or her school career. Concentration difficulties that may be experienced negatively impact development potentially resulting in learning delays as mentioned. Research in reality revealed that high screen-time is associated with deleterious effects on irritability, low mood and cognitive and socio-emotional development, leading to poor educational performance, hence affecting concentration levels (Stiglic & Viner, 2019; Lee, 2018). Lee (2018) further indicated that some common signs of stress and anxiety include behavioural or emotional signs, which include difficulty concentrating, as well as various other signs, which are not mentioned as it is not relevant to this research. These researchers confirmed some of the effects related to how children develop during the technological era, and affecting their behavioural and emotional well-being and then in essence school readiness, which in turn is my experience with Grade R learners' concentration levels for school readiness (Stiglic & Viner, 2019; Lee 2018).

In reality, while it is true that every child is different and developmental milestones happen at a certain window of time, some children reach certain milestones earlier or later. Children are not the only one's affected by this but also all stakeholders involved

in child development. These ranges just give a framework of approximately for certain skills to develop (Cherry, 2021). The Centre for Disease Control and Prevention (CDC) made it clear that all stakeholders (parents, grandparents, caregivers, as well as early childhood providers) can participate in developmental monitoring. This include monitoring how children grow and changes over time and whether they meet the typical developmental milestones in playing, learning, speaking, behaving, and moving. A missed milestone could be an indication or a sign of a problem. This should be addressed when visiting the doctor. Regular check-ups at a doctor/paediatrician and support from all stakeholders to achieve better outcomes, could be a way to bring the real situation closer to the ideal situation, whereby milestones are achieved when it is supposed to and prepare a Grade R learner for Grade 1 in time and on time. In the researcher's personal experience, children who are born later in the year do experience delays in their developmental milestones, compared to their peers, but are able to outgrow it. It is therefore vitally important to seek help as soon as possible to address these problems. Learners with concentration problems are regarded as part of the group that inform Inclusive Education as these learners need support and assistance to make sure they reach their full potential in the teaching and learning environment. This therefore would ensure that Inclusive Education accommodate learners with different learning and development needs in ordinary or mainstream schools. All learners should therefore be included in all forms of teaching and learning and foundation phase teachers are vitally important in this process.

I would like to seek solutions to the problems parents, teachers and children alike struggle with, especially children who are born later in the year and are behind on in various developmental milestones due to age. If positive results yield, Brain Gain Neurofeedback could assist all Grade R learners' concentration levels to improve and be vitally important to Grade R learners' transitioning from Grade R to Grade 1. Neurofeedback thus could potentially provide a means of support to teachers as

teachers are in desperate need to support learners with concentration difficulties. The following primary and secondary questions inform the scope of the study:

Primary Research Question:

- What are teachers' experiences regarding the concentration levels of Grade R learners?

Secondary Research Questions:

- What is the influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness?
- How does Neurofeedback Training impact and influence school readiness of Grade R learners?
- What are the perceptions of teachers regarding the implementation of Neurofeedback Training in schools?
- How can Neurofeedback Training be implemented into the schooling system of South African Schools?
- How can teachers be supported to assist in the implementation of Neurofeedback Training?

1.3. AIMS AND OBJECTIVES OF THE RESEARCH

The following are the resultant aims the study wishes to address in the investigation of the influences of neurofeedback training on Grade R learners' concentration levels for school readiness. These correlate with the primary and secondary queries mentioned earlier to form the core objectives of the research study, and this will assist the researcher in answering these queries.

- To determine the experiences of teachers with Grade R learners' concentration levels?
- To examine the influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness.
- To determine the impact and influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness.

- To determine the perceptions of teachers regarding the implementation of Neurofeedback Training in schools.
- To determine if Neurofeedback Training can be implemented into the South African schooling system.
- To determine the support teachers, need to assist with the implementation of Neurofeedback Training.

1.4. CLARIFICATION OF TERMS

In this section, the concepts of *neurofeedback, concentration, educator (teacher), early childhood development* and *learner* will be elucidated to define the terms within the parameters of the study.

According to Merriam-Webster Dictionary.com Medical Dictionary 'neurofeedback' can be defined as:

> *'the technique of making brain activity perceptible to the senses (as by recording brain waves with an electroencephalograph and presenting the visually or audibly) in order to consciously alter such activity.'*

Thus, Ellison (2010) explain and define 'neurofeedback' in the New York Times in an understandable way, as a type of biofeedback for the brain, which allow patients to alter their own brain waves through repetition and practice. This explanation and definition would be crucial in understanding neurofeedback in terms of its goals set in this study.

'Concentration' is defined as:

> *'the action or power of focusing all one's attention'* (Oxford Languages, 2021).

Meaning a person is able to focus his/her attention on one single action at a time, hence concentrating on a particular action taking place at a given time.

According to Nel (2007), 'Early Childhood Development' encompass and is defined by several sources from the Department of Education, as "an umbrella term, which applies

to the process by which children from birth to nine years grow and thrive as a whole, including: physically, emotionally, mentally, socially, spiritually and morally."

The Glossary for Education Reform (2014) use the term 'learner' as synonym to 'student' and has grown in popularity over the years due to the following factors:
'Learner underscores and reinforce the role of the teacher as learning can occurred in the absence of teaching'.
'Learner update the concept and traditional characteristics and connotations associated with the word student; students sit in classroom; they are taught by teachers. If the goal is to update these connotations, for example, that they can learn both inside and outside of a school or classroom, they can learn independently or form adults who are not in the classroom, they can take more responsibility of what they learn and how they learn. Then distancing the concept from preformed, limiting, or outmoded associations could be useful'.

Therefore, the word 'learner' as used in the South African Schools Act (1996b), refers to those attending school in South Africa from Grade R to Grade 12, and is used throughout this research study with this intended meaning.

The word 'educator', as used in the South African Schools Act (1996b), will be used as synonymous with the word 'educator' in this study, as used in the Revised National Curriculum Statement (2002a, p.9). It refers to mediators of learning, interpreters and designers of learning programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors and learning area/phase specialists.

In this study the researcher would use these definitions as explained in this section, but would like to add the term 'teacher' to be used interchangeable with the term 'educator.' A teacher according to the researcher could be define as a person who helps learners

acquire knowledge and virtue through the practice of teaching, but also setting an example on how to conduct oneself, hence leading by example.

1.5. THEORETICAL FRAMEWORK

This study employs Skinner's Operant Conditioning and Pavlovian Theory of Classical Conditioning Theories. Skinner's Operant Conditioning Theory and Pavlovian Theory of Classical Conditioning explain the manipulation of behaviour using rats and dogs. Similarly, in children behaviour is modified and manipulated by using Skinner's Operant Conditioning Theory by applying neurofeedback training to modify children's concentration levels and by doing this, reinforce positive results by using positive reinforcement. Examples of positive reinforcement include stickers on work well done. Longer periods of being able to concentrate thus have rewards linked to it, which is ethical and acceptable. On the other side if a child does not want to work with the therapist they should be disciplined by being reprimanded in such a way that their negative behaviour is changed or replaced by a positive behaviour.

1.5.1. SKINNER'S OPERANT CONDITIONING THEORY

1.5.1.1. Background of the theory

Skinner (1948) is regarded as the father of operant conditioning. His work was rooted in the view that classical conditioning was far too simplistic to explain the complexity of human behaviour fully. Skinners views on behaviour was not as extreme as Watson (1913), but was rather built on the work of Thorndike's (1898) law of effect. The Skinnerian model assumes that behaviour is conditioned and that reinforcements contribute towards achieving good behaviour when reinforcement procedures are used systematically to direct learners' behaviour in a desired direction (Mohapi, 2007 & Avis et al., 1999). Skinner was very interested in the improvement of the human condition and introduced the concept of operant conditioning. He believed that consequences shape an individual's behaviour (McLeod, 2018). Skinner studied operant conditioning by conducting experiments on animals, placed in a '*Skinner Box'.* A Skinner box, or

Operant Conditioning Chamber, is an expedient used by Skinner to objectively record an animal's behaviour in a compressed time frame. He used rats (lever pressing and pigeons (key pecking); these animals would be rewarded or punished for engaging in these behaviours.

1.5.1.2. Assumptions and principles of this study

He identified three types of responses, or operant, that can follow behaviour:

Neutral operant: responses from the environment that does not increase or decrease the likelihood of a behaviour being repeated.

Reinforce: responses from the environment that increases the probability of a behaviour being repeated, which can be either positive or negative.

Punishers: responses from the environment that decreases the prospect of a behaviour being repeated, as punishment weakens behaviour (McLeod, 2018).

1.5.1.3. Relevancy to this study

The perspectives discussed, are observed in Electroencephalographic (EEG) brain activity, which were called biofeedback and more recently, neurofeedback. Operant (or instrumental) conditioning is regarded as the main learning mechanism in self-regulation of brain activity through neurofeedback (Enriquez-Geppert, Huster & Herrmann, 2017). In short, operant conditioning states that the probability of a future response would depend on the immediate consequence which followed; positive consequences increase the likelihood of given behaviour and vice versa. In retrospect changing the brain's activity through such conditioning is not actually new (Enriquez-Geppert et al., 2017).

EEG has been demonstrated to be responsive to operant and classical conditioning (Leslie et al., 2011). Operant conditioning of EEG brain activity was demonstrated in humans by Kamiya (1966, 2011). These trails were successful due to the attributes of the principles of operant conditioning.

1.5.2. PAVLOVIAN THEORY OF CLASSICAL CONDITIONING

1.5.2.1. Background of the theory

Pavlov (1849 – 1936) thus identified that learning can take place via association. Classical conditioning is a process whereby a previously neutral stimulus (the sound of a bell) is repeatedly paired with an unconditioned stimulus (food), which in turn, elicits an unconditioned response (salivation), therefore a type of learning that happens unconsciously. The researcher's thoughts on classical conditioning would be that an automatic conditioned response is paired with a specific stimulus thus creating a behaviour.

1.5.2.2. Assumptions and principles of this study

Pavlov used dogs in laboratory conditions for his research and discovered the principles underlying classical conditioning. He inserted a tube into the salivary glands of dogs in order to ascertain how much saliva would be secreted when food was placed in their mouths. Later in his research, it was obvious to him that the dogs had started associating the sound of footsteps with the food that they were to be given. After a number of repetitions, the bell becomes a conditioned stimulus, signifying that the dog has now learned to salivate to the sound of a bell. The salivation in reaction to the sound of a bell is called the conditioned response.

He also identified the following influencing factors in the classical conditioning process:

Acquisition refers to the gradual process by which a stimulus acquires the capacity to elicit the conditioned response.

Reinforcement in classical conditioning refers to the repeated, simultaneous presentation of the unconditioned stimulus (UCS) with the conditioned stimulus (CS).

Generalization occurs when the conditioned response (CR) generalizes other stimuli.

Discrimination occurs when an organism is conditioned to make a response to a particular conditioned stimulus (CS), but not to others.

Extinction refers to the phenomenon that the conditioned response disappears if the conditioned stimulus is repeatedly presented on its own.
Spontaneous recovery refers to the tendency of the conditioned response to reappear, after a resting period, without further conditioning (Avis et al., 1999).

In education, Pavlov thought that teachers were able to help learners in anxiety provoking context, by continuously providing reassurance and support to a learner, who might feel anxious reading aloud, to start feeling more calm and comfortable (McLeod, 2018).

1.5.2.3. Applicability of classical conditioning on this study

Self-regulations have been acknowledged as a skill, therefore not only operant conditioning, but also classical conditioning have to be taken into account (Strehl, 2014). Sherlin et al. (2011) demonstrated that the alpha-blocking conditioned response could be conditioned by using various reinforcement styles and therefore verified that all of the Pavlovian types of conditioned responses are fulfilled. There is renewed interest in neurofeedback as a method to self-regulate one's own brain activity to directly alter the underlying neural mechanisms of cognition and behaviour. This resulted in not only a method for cognitive enhancement in healthy people, but also as a therapeutic tool (Enriquez-Geppert et al., 2017).

These theories would therefore have a direct influence on either the development of a child, or self-regulation, which in turn is part definition of neurofeedback. These psychological theories would thus help practitioners to consider the true balance of influences, which are likely to play a part in the development of any young child.

1.6. IMPLICATIONS OF THE STUDY

Self-regulations have been acknowledged as a skill, therefore not only operant conditioning, but also classical conditioning have to be taken into account (Strehl, 2014). Strehl (2014) clarifies in his paper that not only operant conditioning is needed to

acquire the skill of self-regulation but also classical conditioning. He proposes that classical conditioning is imperative as it operates on the basis of trial and error or cueing of behaviour leading to feedback and then reinforcement of what was learned in turn transfer self-regulation skills into everyday life. He suggests in his study that immediate feedback and reinforcement are done over and over helps to transfer self-regulation skills and thus results in capturing thereof. Sherlin et al. (2011) demonstrated that the alpha-blocking conditioned response could be conditioned by using various reinforcement styles and therefore verified that all of the Pavlovian types of conditioned responses are fulfilled. There is renewed interest in neurofeedback as a method to self-regulate one's own brain activity to directly alter the underlying neural mechanisms of cognition and behaviour. This resulted in not only a method for cognitive enhancement in healthy people, but also as a therapeutic tool (Enriquez-Geppert et al., 2017).

These theories would therefore have a direct influence on either the development of a child, or self-regulation, which in turn is part definition of neurofeedback. These psychological theories would thus help practitioners to consider the true balance of influences, which are likely to play a part in the development of any young child. Therefore, both theories are needed to assist in training the brain to self-regulate as they work interchangeable together to achieve this narrative.

1.7. DEMARCATION OF THE STUDY

The research is conducted in the Motheo Education District of Bloemfontein in the Free State. This investigation is limited to Primary Schools in Bloemfontein, willing to participate in the study, forming the research sample. The study attempts to explore the influence of neurofeedback training on Grade R learners' concentration levels for school readiness and the chosen participants are selected in two phases, as this is a mixed method study.

1.8. STRUCTURE OF THE STUDY

The study is divided into five chapters. Each chapter encompasses a specific aspect of the research study and moves systematically from a theoretical discussion to empirical investigation to ultimately combine into a cohesive recommendation for the outcome of the study. The delineation of the chapters is as follows:

Chapter One: Outline of the research to be conducted and include, introduction, background, problem statement as well as the aims and objectives of this study.
Chapter Two: Literature review on neurofeedback training and the positive impact on concentration levels of Grade R learners, as well as theoretical perspectives thereof.
Chapter Three: Research design and methodology on neurofeedback training and the positive impact on concentration levels of Grade R learners born in the second half of the year.
Chapter Four: Analysis of data and results on neurofeedback training and the positive impact on concentration levels of Grade R learners.
Chapter Five: Findings, conclusions and recommendations on neurofeedback training and the positive impact on concentration levels of Grade R learners born in the second half of the year.

1.9. SUMMARY

This chapter clarified the main objective of the study: to explore the influences of neurofeedback training on Grade R learners' concentration levels for school readiness in Primary Schools in Bloemfontein. It explained the significance of the study in terms of the relevant role it can play to assist in developing new techniques to assist the Department of Education, educators, learners and parents with concentration issues that are relevant to this age and day. This study is motivated by the researcher's background with her own child and the need to improve learners' ability to adapt to 'Big School' in terms of concentration and in general adjusting to sitting still, listening to educators while teaching and growing and developing holistically to reach their full

potential. This in turn will assist with developing possible solutions to the problem by convincing the Department of Education that neurofeedback training should be implemented into the school curriculum to assist all learners, educators and parents.

In the following chapter, diverse authors' views are reviewed to examine the different aspects on neurofeedback training and concentration levels. The literature reviews also include: An analysis of neurofeedback, analysis of concentration, Child development, School readiness, Causes of concentration problems, Educators' views on concentration and concentration problems and the relationship between educators, parents and learners.

CHAPTER 2: LITERATURE REVIEW

2.1. INTRODUCTION

After 1994, there was a general tendency to find solutions to the inequalities of the past and therefore a more holistic approach to be followed (Nel, 2007). In order to understand the complexity of this study, it is important to note the past inequalities and the effect of it on children, specifically on their concentration levels within the classroom and the changes it brought to where the education system is today.

It is of great need to grasp the fact that inequalities, poverty and inadequate jobs/job losses have dire consequence and impact the percentage of learners struggling with concentration problems, which include Attention Deficit Hyperactive Disorder and Attention Deficit Disorder. The Department of Education persuaded a Nation-wide Audit on Early Childhood Development (ECD) Provisioning, and it stated that all ECD facilities should provide a high standard and good quality care to children to aid in their development, regardless of the parents' choice. (South African Department of Education [DOE] 2001a, p. 4). This audit stated that ECD was not only essential for assisting children's transition to formal schooling, but to identify children at risk from social, behavioural, health problems and learning difficulties (Nel, 2007).

It is critical to understand that family life differs from one child to the next, in terms of composition, values and roles within each family. All young children should have access not only to food and shelter, but also loving care that fosters both physical and cognitive development and psychosocial support (Nel, 2007).

A study executed by Schoeman (2015), a South African psychiatrist, indicated that 5% of children in South Africa are diagnosed with and suffer from ADHD. She states that many children in South Africa are not formally diagnosed, but are labelled as naughty or imprudent, due to a lack of knowledge in their communities. The Centre for Disease

Control and Prevention states that 9.4% of United States children are diagnosed with ADHD, more boys are affected than girls, 12.9% and 5.6% respectively.

The question of the effect of low concentration levels in Grade R learners, and the possible positive impact of using neurofeedback, require more investigation and the starting point is to explore the theoretical frameworks of psycho-social paradigms with regard to the topic at hand, as well as seeking clarity on why school children tend to struggle with concentration and attention problems.

2.2. THEORIES WITH REGARD TO NEUROFEEDBACK AND CONCENTRATION

In order to understand and grasp the concept of neurofeedback and concentration, the researcher looked at the purpose of psychological theories. This helped to clarify the various educational theories in this research to give some perspectives with regard to the difficulty in explaining this complex subject, but also to explain why these theories are relevant to this study. The learning theories of development, focus on the environmental influences on the learning process. Such environmental influences include associations, reinforcements, punishments, and observations.

2.2.1 BEHAVIOURISM

Behaviourism theorists view learners as a blank canvas who should be provided with experiences and this therefore emphasizes the role of the teacher in the classroom (Saunders & Wong, 2020 & Kelly, 2012). They believe that knowledge exists independently and outside of people. Behaviourists believe that learning occurs when new behaviour or changes in behaviour are developed through links between stimuli and responses (Saunders & Wong, 2020 & Kelly, 2012). McCloud (2015) further states that behaviourists further focused their studies on behaviour that could be empirically observed, as well as actions that could be measured and tested instead of emotions. This study employs the following behaviourist theories: Skinner's Operant Conditioning and Pavlovian Classical Conditioning Theories.

2.2.1.1. SKINNER'S OPERANT CONDITIONING THEORY

2.2.1.1.1. Background of the theory

Burrhus Frederic (B.F.) Skinner was an American psychologist and well-known for developing the theory of behaviourism. To Skinner, psychology was synonymous with an organism's interactions between its environment and its own behaviour. (Fritze, 2019). Skinner is regarded as the father of operant conditioning. His work was rooted in the view that classical conditioning was far too simplistic to explain the complexity of human behaviour fully. The theory of Skinner assumes that behaviour is conditioned and that reinforcements contribute towards achieving good behaviour when reinforcement procedures are used systematically to direct learners' behaviour in a desired direction (Mohapi, 2007 & Avis et al., 1999). He focused on operant behaviour and therefore reformed towards how an organism's behaviour was shaped over the course of its lifespan by its environment and the consequences of its behaviour.

2.2.1.1.2 Assumptions and principles of this theory

Skinner was interested in the improvement of the human condition and introduced the concept of operant conditioning. He believed that consequences shape an individual's behaviour (McLeod, 2018). Skinner studied operant conditioning by conducting experiments on animals, placed in a '*Skinner Box'.* A Skinner box, or Operant Conditioning Chamber, is an experiment used by Skinner to record an animal's behaviour in a compressed period. An animal can be punished or rewarded for engaging in certain behaviours, such as lever pressing (for rats) and key pecking (for pigeons).

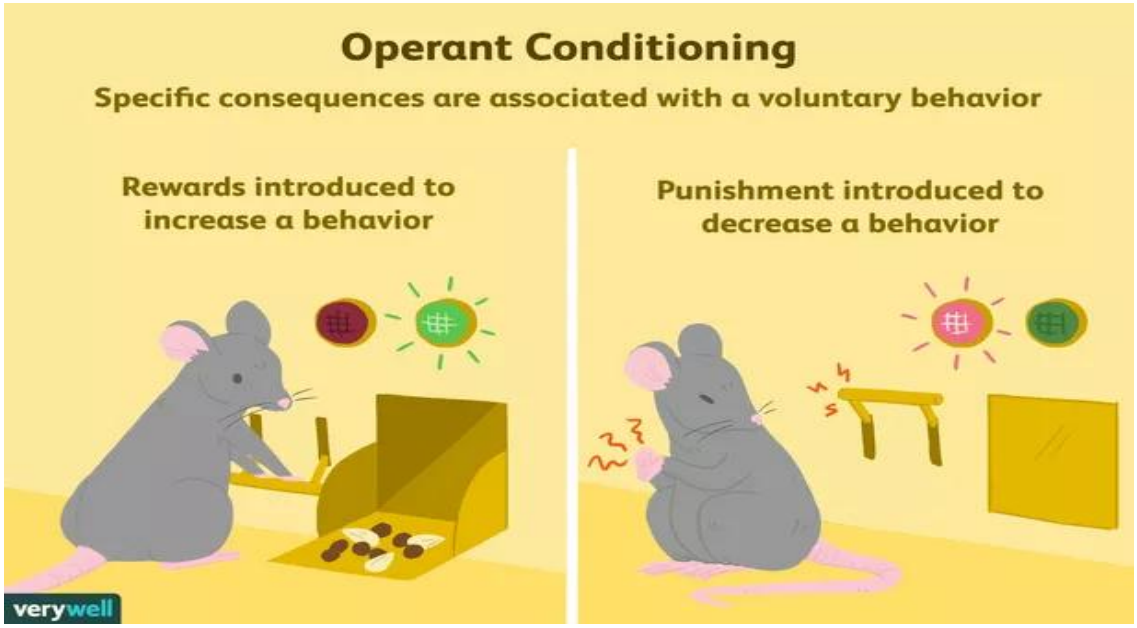

Figure 2.1: Skinners Operant Conditioning Verywell / Cherry (2022)

He identified three types of responses that can follow behaviour:

Neutral: responses from the environment that does not increase or decrease the likelihood of a behaviour being repeated.

Reinforce: responses from the environment that increases the probability of a behaviour being repeated, which can be either positive or negative.

Punishers: responses from the environment that decreases the prospect of a behaviour being repeated, and punishment deters behaviour (McLeod, 2018).

Skinner was a psychologist who believed that observing people's behaviour is an indication of how they learn. Skinner believed that learning meant changing behaviours (Saunders & Wong, 2020). According to Skinner, people learned in two ways: by striving for the positive and avoiding the negative (Skinner, 2014).

2.2.1.1.3 Relevancy to this study

The perspectives discussed, are observed in Electroencephalographic (EEG) brain activity, which were called biofeedback and more recently, neurofeedback. Operant (or

instrumental) conditioning is regarded as the main learning mechanism in self-regulation of brain activity through neurofeedback (Enriquez-Geppert, Huster & Herrmann, 2017). In short, operant conditioning states that the probability of a future response would depend on the immediate consequence which followed; positive consequences increase the likelihood of given behaviour and vice versa. In retrospect changing the brain's activity through such conditioning, is not new (Enriquez-Geppert et al., 2017).

EEG has been demonstrated to be responsive to operant and classical conditioning (Leslie et al., 2011). Operant conditioning of EEG brain activity was demonstrated in humans by Kamiya (1966, 2011). These trails were successful due to the attributes of the principles of operant conditioning. Thatcher (2017), empahsized that Skinner defined the rules or principles of operant conditioning by the use of a reinforcer, which is an effective reward or punishment delivered after a response that increases or decreases the future probability of that response occurring again. The reinforcer could also be the feedback signal, once it is associated with a reward or punishment. The terms used in operant conditioning, as negative and positive, also apply to the presentation or removal of reinforcement. The purpose of these studies was to reduce symptoms and improve clinical outcomes in patients with a variety disorders, for example, attention deficits, anxiety, obsessive compulsion, to name a few. Patients that undergo EEG biofeedback do not intentionally change their own brain waves, but simply attend to a continuous stimulus, which is linked to a future reward and would then be called a reinforcer. The future reward would be something of value to the patient, for example, doing better in school, that the person achieves if they meet the criteria for EEG change, determined by the clinician (Thatcher, 2017).

2.2.1.2. PAVLOVIAN THEORY OF CLASSICAL CONDITIONING

2.2.1.2.1. Background of the theory

Pavlov (1849 – 1936), a Russian psychologist, contributed toward science, which was made possible by his method of studying healthy animals in natural conditions (Gantt,

2021). He further formulated the idea of conditioned reflex, because of his ability to reduce a complex situation to the simple terms of an experiment. Pavlov identified that learning can take place via association. Classical conditioning is a process whereby a previously neutral stimulus (the sound of a bell) is repeatedly paired with an unconditioned stimulus (food), which in turn, elicits an unconditioned response (salivation).

2.2.1.2.2. Assumptions and principles of this theory

Pavlov used dogs in laboratory conditions for his research and discovered the principles underlying classical conditioning. He inserted a tube into the salivary glands of dogs in order to ascertain how much saliva would be secreted when food was placed in their mouths. Later in his research, it was obvious to him that the dogs had started associating the sound of footsteps with the food that they were to be given. After a number of repetitions, the bell becomes a conditioned stimulus, signifying that the dog has now learned to salivate to the sound of a bell. The salivation in reaction to the sound of a bell, is called the conditioned response (Cherry & Gans, 2022).

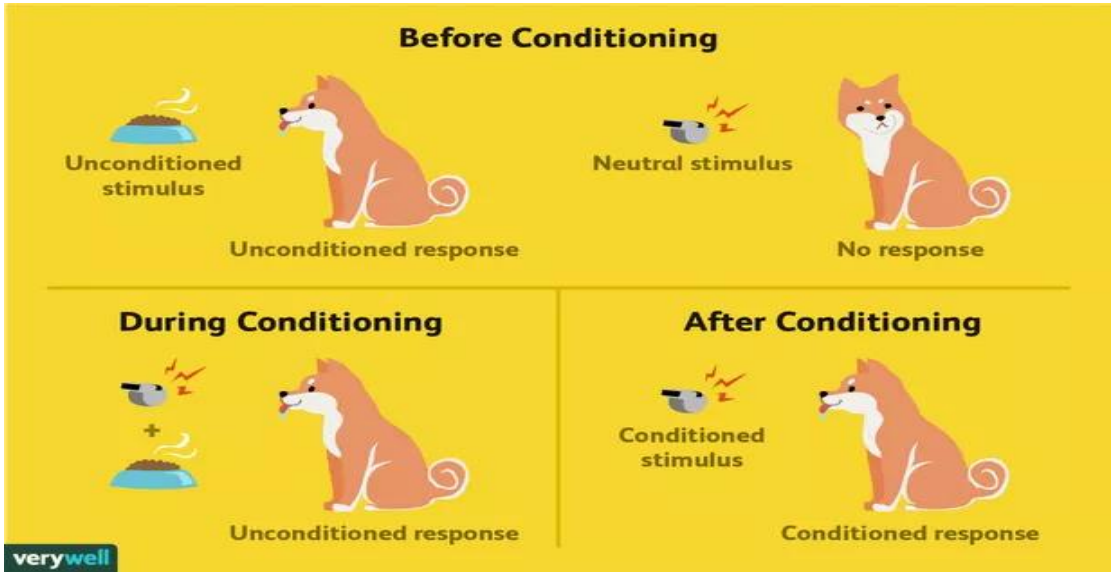

Figure 2.2: Pavlov's Classical Conditioning Verywell / Cherry (2020)

He also identified the following influencing factors in the classical conditioning process:

a) *Acquisition* refers to the gradual process by which a stimulus acquires the capacity to elicit the conditioned response.
b) *Reinforcement* in classical conditioning refers to the repeated, simultaneous presentation of the Unconditioned Stimulus (UCS) with the Conditioned Stimulus (CS).
c) *Generalization* occurs when the Conditioned Response (CR) generalizes other stimuli.
d) *Discrimination* occurs when an organism is conditioned to make a response to a particular Conditioned Stimulus (CS), but not to others.
e) *Extinction* refers to the phenomenon that the conditioned response disappears if the conditioned stimulus is repeatedly presented on its own.
f) Spontaneous recovery refers to the tendency of the conditioned response to reappear, after a resting period, without further conditioning (Avis, Pauw & Van der Spuy, 1999 & Cherry et.al., 2022).

In education, Pavlov thought that teachers were able to help learners in an anxiety provoking context, by continuously providing reassurance and support to a learner, who might feel anxious reading aloud, to start feeling more calm and comfortable (McLeod, 2018).

2.2.1.2.3. Relevancy to this study

Self-regulations have been acknowledged as a skill, because it is the ability to pause and think before reacting or taking action according to Cunic (2022). Furthermore, self-regulations are a skill which develop during childhood and is regarded as being able to manage ones' emotions, behaviour, and body movements to reach a goal or when faced with a difficult situation and to be able to do this while staying focused or paying attention Cuncic (2022) and Morin (2023), consequently, not only operant conditioning, but also classical conditioning have to be taken into account (Strehl, 2014). Sherlin et al. (2011), demonstrated that the alpha-blocking conditioned response could be

conditioned by using various reinforcement styles and therefore verified that all of the Pavlovian types of conditioned responses, are fulfilled. There is renewed interest in neurofeedback as a method to self-regulate one's own brain activity to directly alter the underlying neural mechanisms of cognition and behaviour. This resulted in not only a method for cognitive enhancement in healthy people, but also as a therapeutic tool (Enriquez-Geppert et al., 2017).

These theories would therefore have a direct influence on either the development of a child, or self-regulation, which in turn is part definition of neurofeedback, as it aims to self-regulate different brain functions. These psychological theories would thus help practitioners to consider the true balance of influences, which are likely to play a part in the development of any young child.

2.2.1.3. POSSIBLE LIMITATIONS OF SKINNER'S OPERANT CONDITIONING AND THE PAVLOVIAN THEORY OF CLASSICAL CONDITIONING

According to Roundy (2022), operant and classical conditioning would be impeded if interferences with the association between a stimulus and response occur when there is a compound stimulus. This happens when more than one stimulus is presented at the same time and can be divided into two types of compound stimulus: overshadowing and blocking.

Overshadowing occurs if the strongest part of the stimulus is associated with the response, but the weaker part is not. An example is when a buzzer and red light indicate food for a dog. When these stimuli are tested separately the dog would get excited upon hearing the buzzer, but does not react to the light. If the light was the only stimulus, the dog would have associated it with food, but the dog was not conditioned using the light therefore, because it was paired with the buzzer, the stimulus was overshadowed by the buzzer (Roundy, 2022).

Blocking happens when a stimulus already learned, interferes with associating a new stimulus. Thus, the idea behind the saying: 'you can't teach an old dog new tricks.' For instance, if a dog was taught using a red light as stimulus to associate with food, if a buzzer is added for a period of time, he would not react to the buzzer, as the presence of an old stimulus was blocking the association with the added new stimulus (Roundy, 2022).

Thus conditioning can be unsuccessful when the stimulus-response relationship is impeded. Regoli (2019) mentions that classical and operant conditioning has various limitations, as it does not take free will into consideration of individuals; the uniqueness of individuals is underestimated when learning takes place and people tend to respond differently to the stimulus they encounter in the environment around them. It should be remembered that classical conditioning does not help people create new experiences, but rather a learning process that connects a natural response to the stimulus that is in the environment. Numerous variables, such as individual perspectives, experiences and habits, are just as important to the final outcome as the external factors that are present the moment a choice is made. People can also choose to act against their conditioning. The difference between operant conditioning and classical conditioning is, for operant conditioning to work, the subject must first display a behaviour, which will be either rewarded or punished. Classical conditioning, on the other hand, involves the forming of an association with an already natural occurring event (Cherry, 2020).

2.3. DEFINING & UNDERSTANDING NEUROFEEDBACK

2.3.1. DEFINING NEUROFEEDBACK

Kahn, Gusman and Wintner (2019), define neurofeedback as: 'The process whereby an individual is presented with a real-time of his or her own neurological patterns, learns strategies to manipulate brain waves, and aims to self-regulate different brain functions.' Neurofeedback is a preparation technique that helps things discover how to self-manage mind activity accompanying the use of affecting animate nerve organs

feedback, given by neurological devices. These neurofeedback preparation approaches alter brain endeavour again, which is established particular affecting animate nerve organs measures. A number of related research, supports evidence that neurofeedback preparation is efficiently second-hand in consideration of improve neuropsychological disorders, develop intelligent efficiency, and improve intellect functions in healthy things (Wyckoff & Birbaumer, 2013, Enriquez-Geppert et al., 2017 & Kahn, Gusman & Wintner, 2019).

2.3.2. NEUROFEEDBACK TRAINING TYPES

Cognitive functions or brain disorders could improve by employing several types of neurofeedback training methods depending on the treatment case. Neurofeedback training protocols focus on the alpha, beta, delta, theta and gamma treatment or a combination of these wave ratio's (Rodrak & Wongsawat, 2012). The most common type of neurofeedback training is electroencephalogram (EEG) neurofeedback. Electrodes are place on the person's scalp, which detect and evaluate possible brain wave abnormalities, and this help to control the trainee to be able to improve his/her brain activity consciously (Plerou & Vlamous, 2016). The purpose of EEG neurofeedback is to normalize abnormal EEG frequencies, thus decreasing the theta ratio and increasing the sensory motor rhythm activity in order to reach an improved cognitive performance. The beta training is used to improve concentration among others.

Hemoencephalography (HEG) is a neurofeedback method where the trainee regulates consciously the cortical blood flow (Plerou & Vlamous, 2016). This technique is based on the idea that neurological feedback provided by the HEG device trainee could consciously control the unconscious blood flow process. HEG is considered to be an effective method for alleviating unwanted psychological impairment stemming from poor blood flow. Specifically, near-infrared HEG is designed to measure changes in oxygen levels within the blood and passive infrared HEG incorporates with the measurement of

cortical heat and blood oxygen levels (Toomin et al., 2005; Rodrak et al., 2012; Plerou et al., 2016 & Toomim & Carmen, 2016). According to Plerou & Vlamous (2016), learners with attention-deficit/hyperactivity disorder tend to have decreased blood flow to the prefontal cortex region and therefore HEG neurofeedback training are recommended to increase blood flow to this region.

The data represented are graphically displayed or interpreted on a digital screen (i.e., computer monitor or tablet). The individual wields cognitive control over brain activity in an effort to manipulate the outcome. Therefore, an individual learns to self-regulate brain activity, if it is to provide symptomatic or functional gains, neurofeedback becomes a therapy (Toomim, 2015; Plerou et al., 2016 & Kahn et al., 2019).

According to Kahn et al. (2019) and Patino (2022), a certified or qualified Neurofeedback therapist would instruct a participant to observe and manipulate their own brain behaviour in a way that aims to build or change brain biology and function to improve overall health. When a well-trained Neurofeedback therapist apply and use neurofeedback correctly, it can be a valuable tool in treating neurocognitive or psychological disorder, like attentions disorders, depression, or in enhancing mental strategies, like inhibitory control or alertness

2.3.3 BRAIN GAIN NEUROFEEDBACK PROGRAM EXPLAINED

Brain Gain Neurofeedback is a computer-controlled method of testing brain function. It gauges the amount of nourishing, oxygen-rich blood that is being directed to the frontal lobe while the person is engaged in a mental activity, such as watching a film or playing a game. This process creates a feedback system that can be monitored in real-time, so that the amount of attention the brain is investing in the task can be detected. So long as the individual is concentrating on the task, the brain's activity and the flow of oxygenated blood will remain stable or rise; this is referred to as Neurovascular Coupling. Whenever the person loses focus, the activity in their frontal lobe will decrease, followed by a reduction in blood flow and the movie or game will pause,

alerting the person that their concentration has faltered. The movie or game will only start again once they have regained their focus. (https://www.braingainworld.com).

Two individuals in the study went through a Brain Gain neurofeedback program. They managed to teach their brains to improve the capability of their cognitive centres located in the frontal lobe and to keep up the activation for a more extended period. The schedule for the training differed depending on the age and performance. The frontal lobe is the part of the brain that is in charge of motor functions and intellectual skills. It is the largest of the four lobes and is as a matter of fact, the "control panel" of our character and capacity to communicate. It is accountable for executive capacities, such as focus, learning, trouble-solving, adhering to instructions, and more advanced thinking, in addition to controlling numerous components of attitude, behaviour, impulse control, and social understanding (Sendic, 2022).

2.3.4 TESCA (TEST OF EMOTIONAL STABILITY AND COGNITIVE STABILITY) PRE- AND -POST TEST FOR NEUROFEEDBACK TRAINING TERMINOLOGY EXPLAINED

The following terms are used to better understand and explain the TESCA (Test of Emotional Stability and Cognitive Stability)

Omissions: an indication of how many targets were missed during each section of the test. Missed targets signify inattention. The less targets missed, the higher the score.

Commissions: an indication of how many non-targets were treated as targets during each section of the test. Commissions signify impulsivity. The less commissions, the higher the score.

Response time: indicates the time taken to respond to a target. The lower the time, the higher the score.

Response variability: is an indication of the consistency of reaction times throughout the test. The more constant the reaction time, the higher the score.

D Prime: is a calculation of the probability of accurate detection of the targets.

The result of the TESCA (Test of Emotional Stability and Cognitive Stability) (pre-test) will be discussed using the above mentioned terminology.

2.4. DEFINING & UNDERSTANDING CONCENTRATION AND ATTENTION

2.4.1 DEFINITION OF CONCENTRATION

Moran (2012) defines concentration as an 'intentional process that involves the ability to focus on the task at hand while ignoring distractions. Cognitive research shows that it is vital for success in any field of skilled performance'. Sasson (2021) defines concentration in six points as 'the ability to direct one's attention in accordance to one's will'.

Concentration therefore, means control: the ability to focus the mind on one subject, object or thought without distractions; being able to focus attention and at the same time, ignore unrelated thoughts; to be able to do one thing at a time, instead of jumping from one task/subject to the next, and lose attention, time and energy; concentration is a state, in which one's whole attention is engrossed in one thing only, and being oblivious to one's surroundings or everything else for that matter. Concentration could therefore be defined in education/schooling as the skill needed by a learner to ponder on a given task for a period of time without any distractions, either by one's thoughts or others' actions. Looking at these definitions, one can conclude that concentration or to be able to concentrate the mind, is crucial in every area of life (Castle & Buckler, 2009).

2.4.2 DEFINITION OF ATTENTION

Cherry (2021) defines attention as the ability to be able to actively process information in the environment, while tuning out other details. It is important to have ways to effectively manage the attention resources we have available, in order to make sense of the world, as attention is limited in terms of both capacity and duration. Linsay (2020) indicated that attention is certainly far from a clear and unified concept, but despite its many vague and conflicting definitions, there is an important core quality of attention

that is demonstrably of high importance to information processing in the brain and, increasingly, artificial systems and hence, neurofeedback training.

As noted by Cherry (2021) and Brand (2010), the oldest definition of attention is attributed to William James (1890), who stated that every individual is well aware of what attention is - the ability to concentrate on one particular thought or idea, while simultaneously disregarding others. This involves focusing the mind on a particular object or concept in a vivid and clear manner.

2.4.3 LINKING OF CONCENTRATION AND ATTENTION

To be able to link concentration and attention, one needs to understand the classroom scenario. According to Castle et al., (2009), in a classroom a teacher teaches and a learner learns, but various internal (motivation, fatigued etc.) and external (visual, auditory etc.) factors influence this straightforward and uncomplicated relationship, which have a significant influence on the excellence of the teaching and learning taking place. The time spent in a classroom therefore, would be worthless if a learner does not learn in a classroom.

According to Castle et al. (2009), attention and concentration are not the same, but are often times used interchangeable. Brand (2010) used a figure to explain this relationship, as well as how concentration and attention link to one another. According to Brand (2010), Figure 3 implies that there is an association between the teacher and the student that is based on teaching. The instructor takes advantage of diverse strategies to concentrate the pupil's attention on the target of learning for the purpose of comprehension. Aiming the student's focus on the designated target is necessary for the student to gain attention. The educator has an existing bond with the target to help the learner form a similar connection with the target to be able to learn. If the learner concentrates on the desired target, the attention is seized and if the focus is maintained over a period of time, it turns into concentration (Brand, 2010).

Concentration however, can be lost at any given time, which would divert back to attention and thus focus on a new target. This target is often not necessarily intended by the teacher for the learner at that point in time, therefore, the teacher needs to focus the learner's attention on a continuous basis on the required target, in order for teaching and learning to effectively take place. It the learner's attention is however focussed on the required learning material, over a period of time and the learner maintains this focus of attention, this sustained or continual attention is concentration (Castle et al., 2009).

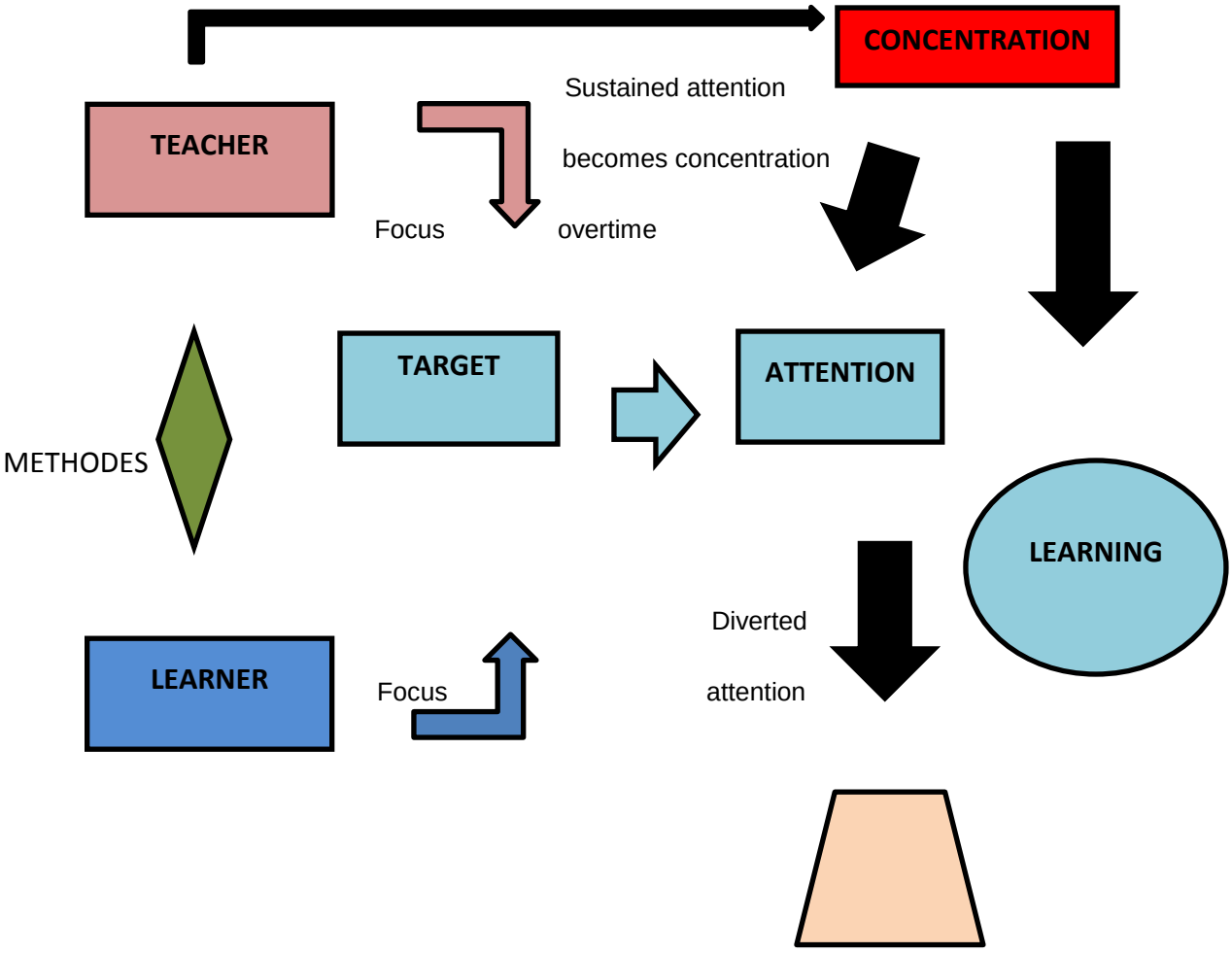

Figure 2.3: Interchange ability of Concentration and Attention explained by Brand 2010 pg. 1

Neurofeedback is a preparation method that helps individuals discover by what method to self-regulate intelligence venture with the use of affecting animate nerve organs response, provided by neural instruments. These neurofeedback training approaches lessen mind activity again, that is based on particular affecting animate nerve organs measures (Kahn, Gusman & Wintner, 2019).

As seen above, neurofeedback however, is intended to be a training technique that would help the individual learner to self-regulate brain activity with the use of neurological feedback, provided by sensory devices, to be able to focus one's attention and therefore teaches themselves to be able to concentrate for longer periods at a time.

2.5. CHILD DEVELOPMENT

In this study it is necessary to look at child development as a loss of concentration/focus are caused by various underlying conditions such as physical, emotional delays and mild cognitive impairments just to name a few, which all fall under the child development umbrella. According to Bee and Boyd (2004) and the Centre for Disease Control and Prevention (CDC) (2021), child development can be defined as the process, which a child changes over time as they grow older. Child development encompasses physical growth/development, cognitive/intellectual development, language and communication development, as well as emotional and social development, and therefore, all aspects of child development are interconnected. The Centre for Disease Control and Prevention (CDC) (2021), added that healthy development of a child with all abilities, including special health care needs, means they are able to grow up while all their social, emotional and educational needs are met. Important factors include a safe and loving home, spending time with family whereby they can play, sing, read and communicate (talk), which are important. A big difference is also made in proper healthy child development if children receive proper nutrition, exercise and sleep. These aspects are often considered separate, but in reality each influence all of the others (Bee et al., 2004 & Singh, 2017), proper nutrition is need to be able to sleep and exercise, enough sleep

is needed to be able to exercise and have a healthy nutritious meal and lastly to be able to exercise one need to sleep enough and have a nutritious meal. Various factors influence the progression of child development within a given individual. Factors include the biological makeup of each child and external influences, which include family, socioeconomic factors, health and culture (Psychology Today, 2022). Early childhood is a time of tremendous growth through all areas of development (Singh, 2017). This section sheds some light on whole child developmental aspects and what is anticipated by each.

2.5.1. SOCIAL AND EMOTIONAL DEVELOPMENT

Singh (2017) and Cherry (2021) state that a tremendous amount of socio-emotional skills develops in early childhood and include the formation of peer relationships, gender identification, and the development of a sense between right and wrong. Palmer (2019) and Cherry (2021) also refer to young children's social and emotional skills they acquire as regulating emotions (experiencing temper tantrums, mood swings), sharing with others (expanding their social world) and following instructions. Healthy social and emotional development, according to Palmer (2019), is a nurturing and responsive relationship with family, friends and caregivers. Cherry (2021) furthermore states that emotional development and social skills are needed for school readiness, and examples of these abilities include: pay attentions to adults' instructions, cooperating with peers and transition from one activity to the next with ease.

2.5.2. LANGUAGE AND COMMUNICATION SKILLS

The development of language is essential for a child to interact and communicate with others. Communication and language development is about more than talking, it includes all the various ways a child understands and communicates, only a part of which are spoken words (Goode & Levitas, 2019 & Stephens, 2007). Gooden (2013) clarifies communication in early childhood as important, as it is one of the major developmental tasks in early childhood. Learning to communicate is key for children to

interact with the person in their world and to meet their needs. Communication development for children include gaining skills to understand and express thoughts, feelings, and information.

Language and communication development begin before birth (during pregnancy) and continues through life, as children see, hear and interpret information from other people and the world around them. Gooden (2013), Indrayani (2016), Goode and Levitas (2019) further state that language expression starts with head, eye and body movements, hand motions and simple vocalizations. It progresses to words, sentences, and conversations by using various methods, such as gestures, spoken words, sign language and pictorial language systems. Communication and language development is important, because speaking is an indicator of fine motor development and a reflection of cognitive development.

2.5.3. COGNITIVE DEVELOPMENT

Cognitive development, according to Siegler (2022), refers to the development of thinking across your lifespan. Gauvain and Richert (2015) add that cognitive development is the process where humans acquire, organize and learn to use knowledge. Thinking is difficult to define as no clear boundaries separate thinking form other mental activities, but thinking involves higher mental processes, such as problem solving, reasoning, creating, etc. (Siegler, 2022). Children's thinking changes dramatically over time and even in surprising ways. Thinking however, includes other mental processes that seem more basic whereby toddlers are skilled in; such as being able to perceive objects and events in the environment, acting skilfully by using objects to obtain goals, and being able to understand and produce language (Raising Children Network [RCN] 2021 & Siegler, 2022).

In other words, cognitive development is immensely important and forms the foundation for many of the other skills a child will learn later in life. Children at play are creating situations for solving problems, creating experiments, thinking and learning all the time

(Raising Children Network [RCN] 2021). Therefore, play is important for pre-schoolers' cognitive development.

2.5.4. PHYSICAL DEVELOPMENT

Allen and Kelly (2015) and Oswalt (2021), refer to physical development as children's ability to use and control their bodies. Physical development is complex and go hand-in-hand with cognitive development, thus encompassing healthy physical growth, developing the sensory system (including vision and hearing); and development of the ability to use the musculoskeletal system for gross motor skills that involve large body movements, as well as fine motor skills that requires precision and the controlled production of sound and speaking. Sensory and motor development, according to Allen and Kelly (2015), are vitally important for classroom activities, as well as everyday functioning, that contribute to cognitive development, early learning and eventually leading to academic achievements.

Oswalt (2021) further refers to physical development as children's abilities to learn about the world around them by using their physical senses of sight, touch, smell, sound, and taste. As infants and toddlers grow, their bodies and minds become capable of simple to more complex movements and experiences. Physical development should be encouraging by teachers, caregivers and parents. Preparing infants and toddlers for school readiness, does not just involve a set of taught skills, but a healthy and happy toddler, is more likely to engage in learning. Physical development and health are therefore important to assist children in activities that support language development, social skills, and other areas of learning for school success (Oswalt, 2021).

2.6. SCHOOL READINESS

2.6.1 HOW SCHOOL READINESS HAS BEEN DEFINED?

Pan, Trang, Love and Tremplin (2019) and Bezuidenhout (2017) define school readiness as the skills, knowledge, and abilities that children need to succeed in formal schooling, which for most, begins at kindergarten, thus total child readiness to benefit

from formal education. The most recent perspectives have shifted to a holistic, multidimensional approach and definition of school readiness, whereby the importance of personal and social skills are emphasized, as well as the roles of families and communities. Thus, children's readiness level depends on their skills and cognitive maturity level, but schools and communities also need to be ready to support children's future success across multiple developmental domains, according to Pan et al. (2019).

According to High (2008), school readiness started off with a national mantra, 'Ready to Learn' in 1991, by the National Educational Goals Panel, whereby their first goal was that by the year 2000, all children will enter school, ready to learn. They also identified school readiness in a child as determined by a set of interdependent developmental trajectories. They described three components of school readiness broadly, as the definition thereof as follows:

Readiness in the child, is defined by; whole child approach in readiness for formal education, including their physical well-being and motor development, social and emotional development, language development, including listening, speaking, and vocabulary, as well as literacy skills and cognition, including sound-letter association, spatial relations, and number concepts. A child therefore would be announced as school ready if they possess the competency to be able to function self-sufficiently in school with the essential academic and emotional development (Bender, Pham & Carlson, 2011). Schools readiness for children ensured by; the school and the educators that they facilitate a smooth transition between home and school, they are sensitive to cultural differences; striving for continuity between early care and education programs and elementary school; and understanding that learning occurs in the context of relationships; demonstrating commitment to the success of every child through awareness of the needs of individual children without discrimination; schools should demonstrate commitment to the success of every teacher; introducing approaches that raise achievement, such as parent involvement and early intervention for children falling behind; altering practices and programs if they do not benefit children; serving children

in their communities; taking responsibility for results; and having strong leadership (High, 2008). Family and community support contributing to child readiness; whereby mothers and children receive comprehensive health care, and mothers even more so during pregnancy. Sufficient health care, nutrition and daily physical activity will ensure that children arrive at school with a healthy mind and body. High quality preschools should be available to all children with support and devotion from parents and teachers to help children learn, thus for a child to start school successfully is therefore a social and communal endeavour (Docket and Perry, 2017).

De Jager (2019) and Amod et al. (2013) define school-readiness in short, namely that a child has to be able to:
concentrate on a task for at least 11 minutes, even if he dislikes the activity or does not want to (e.g. building a 36-piece puzzle, drawing patterns along the edges of an A4-sheet of paper using forms(■,▲,●) or clipping pegs in a specific pattern and order); listen to instructions the first time; speak and understand the language of instruction in the Grade 1 classroom fluently; AND most importantly, has played outside enough to be able to sit still and is ready to master abstract, symbolic learning activities, such as writing and reading the alphabet and numbers.

2.6.2 WHAT DETERMINES SCHOOL READINESS OR HELPS A CHILD TO BE SCHOOL READY?

Various factors influence school readiness or help a child to be school ready. De Jager (2019, p. 1) in a table format give an overview of the factors that help a child to be ready for school versus impede school readiness. Column one gives an overview of the factors that helps the child to be ready for school versus column two which indicate factors that impede school readiness, some of these stated factors are similar but are influenced by how they are reached and in which order. The table are in a comparison format to assist understanding of how these factors contribute or impede school readiness or have an influence on school readiness in general.

Factors that help the child to be ready	Factors that impede readiness

Full-term baby	Full-term baby
Milestones reached in the right order and within the broad time-limit of each milestone	Milestones reached early or very late; milestones skipped
A happy family with sufficient food and clothing, and decent housing	A disorganised family with members who come and go, and where food, clothing and housing are barely sufficient
A home environment where conflict is resolved and family members cooperate and play together	Constant tension between mother and father or between family members, or tension in the home environment
Healthy food	Normally only starch and sugar, little protein, fruit and vegetables
Good health	Frequent illnesses that force the child to lie down more often than he/she walks about
Healthy ears without fluid	Ears that are often filled with fluid or infected, grommets are needed to help drain the fluid
Healthy skin and no circles under the eyes	Eczema, dry and/or itchy skin, allergies, dark circles under the eyes
Breathes well and effortlessly through the nose	Regular blocked nose or sinusitis, and breathing chiefly through the mouth
Eyes move together as a team	Eyes do not move in the same direction
Eyes see clearly and are able to focus on something held at an elbow's length from the eyes	Squinting to see or nose almost touching something in order to see clearly
Good muscular strength and muscle-tone – i.e. he sits and stands without support	Weak muscles and low muscle-tone – i.e. he seldom sits or stands upright without having to lean against/on something
A home where family members talk to each other	A home where the child is not really spoken to
An abundance of books in the home environment	No books in the home environment
Stories are regularly read and told	Stories are not read or told
Speaks the language of the Gr. 1-class fluently	Mixes languages or only familiar with a few words in the language used in the Gr. 1-class
Frequent and sincere acknowledgement: That's really	Abuse is more familiar than acknowledgement: What

clever thinking! Well done, I'm proud of you!	have you done now? You'll amount to nothing! Idiot!
Good age gap between siblings allows each child in turn some self-centred me-time.	Siblings born close together and where everything, including time and attention, has to be shared
Senses work well together and the brain processes the impulses easily – good sensory integration/processing	Messages from the senses pile up and cause a 'traffic jam' in the brain – weak sensory integration/processing
Listens the first time	Does not listen the first time, or only when told the fourth time
Hears and follows instructions in the right order – the number of consecutive commands matches his/her age	Instructions have to be repeated and only some are followed, or tasks are completed haphazardly
Enjoys touching, handling and investigating	Does not like touching and handling
Likes jungle-gyms, swings and slide games	Avoids equipment or moving surfaces such as escalators, suspension bridges, rope ladders

Table 2.1: Factor comparison for school readiness or impede it by De Jager 2019 pg. 4

High (2008) agrees with De Jager (2019) in her table that individual children's school readiness is determined by their environment in which he/she grows and lives. Thus, this includes the five basic universal needs of children which would include, according to High (2008), First: proper nutrition, economic security, adequate clothing and shelter, appropriate education, and primary and preventative physical and mental health services.

Second: would include, strong nurturing relationships within their families, their communities, and their peer groups.

Third: opportunities to develop their talents and skills and to contribute to their communities.

The fourth basic need include, protection from injury, abuse, and neglect, as well as exposure to violence and discrimination. The fifth and last basic need is a need for healing.

If and when a child has not been able to be protected, children need us to ease the effect of any harm they might have suffered by providing emotional support, by addressing physical and mental health care needs, and by sometimes making amends through restorative judicial practices. To be able to meet these needs, requires comprehensive collaborative approaches, so that children become the priority at the level of their families, the community and the nation, as they are the future leaders of the country.

Hopper (2020) demonstrates Maslow's hierarchy of needs in the figure below in comparison to High's (2008) which are similar, but the figure below help the reader better understand the priority of the basic needs of a human being and thus the importance it has on school readiness for each of these needs to be met as it has an influence on being ready to attend school but also general development of a person and in essence concentration levels in a child.

Figure 2.5: Maslow's hierarchy of needs Hopper (2020)

2.6.3 INAPPROPRIATE USE OF SCHOOL READINESS TESTING

Amod and Heafield (2013) identified that the primary purpose of school readiness assessment is to predict readiness for school entry and to identify children who may benefit or have a need for assistance via additional stimulation programmes, learning support or retention. School readiness assessment, according to Amod and Heafield (2013), is an established field of practice, it generated a great deal of controversy amongst practitioners and researchers. It remains a highly contentious topic in South Africa for various reasons; Amod and Heafield (2013) added that the local developed tool has outdated norms, and historical misuse of these school readiness assessments measures, which have been seen in exclusionary practices and an inadequate education system. High (2008) added to these inappropriate school readiness testing by adding six misconceptions identified by him, which include the following: learning happens only at school, readiness is a specific condition within each child, readiness can be measured easily, readiness is mostly a function of time (maturation), and some children need a little more, children are ready to learn when they can sit quietly at a desk and listen and children who are not ready do not belong in school. Van Niekerk (2020), also included that if a child is not assessed for school readiness and declared ready, the demand placed on the Grade 1 child is high. A child who enters the Grade 1 classroom without the necessary skills, is likely to develop problems, either emotionally, behaviourally or academically. Therefore, school readiness assessments are important to determine the strengths and weaknesses when the child enters Grade 1, and may be beneficial for understanding the academic performance of the child throughout their academic career. This knowledge gained might also be utilised to develop strategies to facilitate effective learning in the child. Bezuidenhout (2017) made it clear that these school readiness assessments are not supposed to be used to discriminate against a learner, but rather to provide relevant support. Amod and Heafield (2013) added their concern, that if considering the myriad of factors, which relate to school readiness assessment/testing in South Africa, a child deficit model is inadequate and denying a

child access to school at their appropriate age could be considered unfair and discriminatory.

Van Niekerk (2020) states that school readiness assessments are formal assessments done by a qualified person, such as an educational psychologist. School readiness tests done by teachers are normally a screening test and not a learning readiness test/assessment. Only a qualified educational psychologist is allowed to do psychometric tests to determine a child's intellectual ability (including an Intelligence Coefficient (IQ) test) in his level of readiness to learn (school readiness). A child's readiness to learn (school readiness) is determined by: his ability to focus and concentrate, the child's own motivation to learn, the child's state of health, his/her emotional maturity and his/her intellectual ability. School readiness tests/assessments are important, according to Van Niekerk (2020), as it provides information on the level of development of a child. Problems are highlighted through a school readiness assessment and can be addressed in time. High (2008) made a point that children who indicate a disability need to be assessed early on, and interventions, should be done to prevent later, more serious problems.

2.6.4 HOW CAN SCHOOLS AND COMMUNITIES PROMOTE SCHOOL READINESS?

Emig (2000), stated that a child's school readiness is a necessary part of defining a school's readiness. Assessing school readiness is difficult and complex. It includes a variety of stakeholders, according to Aiona (2005) and Docket (2017); children, parents, families, teachers, administrators, policy makers, and communities – each of whom bring their own set of values, ideas, perspectives and beliefs to the issues of school readiness. Strong supportive relationships lead to effective transition. Relationships are key mediators of children's competencies, as it provides resources for children and families as they enter a new phase in their lives, thus confronting new expectations and experiences (Docket, 2017). The focus should be to encourage schools, teachers, and parents, and to share the responsibility of school readiness, and to allow for more

successful early learning experiences for children. School readiness assessments should not be a negative experience for children and families; it should be informative and a positive experience assisting in helping and improving, rather than degrading (Amod & Heafield, 2013 & Bezuidenhout, 2017). School readiness assessments should provide teachers and schools with the developmental levels of children; this information should be used to plan instruction and design appropriate learning environments for children. School readiness assessments should also be a two-folded process that looks not just at the child's developmental level, but is also able to look at how well prepared and committed schools are to address the needs of young children. Therefore, schools and teachers should be knowledgeable with regard to early childhood development and understand how children learn and develop skills and knowledge (Aiona, 2005). Emig (2000), stated that a child's school readiness is a necessary part of defining a school's readiness.

2.7. POSSIBLE CAUSES OF CONCENTRATION PROBLEMS

Various factors can contribute to concentration problems and children are usually referred to a psychiatrist or therapist, because of complaints or concerns about their behaviour or development, expressed by a teacher, parent or some other adult. There are however a few major causes of concentration problems, according to Wilhelm (2016):

Lack of sleep: Children need at least 10 hours of proper sleep each night, but due to their over-packed schedules, including sports, homework, clubs, etc., it sometimes hinders their down time. All activities should fit into their schedule, but should allow down time to relax and rest. Children can find it difficult to concentrate in the classroom when they are sleepy or too tired to concentrate (Wilhelm, 2016 & Eatough, 2022).

Family stress and overstretched caregivers: Families experience more burden and stresses today. Parents and children alike sometimes take care of their parents/grandparents or siblings. Family problems, particularly difficulties in the parent-child relationship are often an important causative factor in the symptomatic behaviour

of the child. Families could experience financial constraints, communication issues and these problems cause concern for the children in the home. If parents talk about their problems without boundaries to children, children could feel overwhelmed. This can cause lack of concentration and focus at school. This could also cause the child to experience anxiety, due to these worries or they might be upset (Wilhelm, 2016 & Eatough, 2022).

Poor nutrition: Today quick and easy meals are the way to go in the busy lives of parents. Meals therefore, lack vitamins and healthy choices for nutrition. Young children's brains require fat and muscles need protein. Milk and water are also important, and they should rather avoid high energy drinks. They should add a multivitamin daily as part of their routine and have seasonal fruit on hand as a healthy snack (Wilhelm, 2016 & Eatough, 2022).

Excessive screen time: Oswalt (2021) and Halt (2020) stated that children are more prone to be exposed to the digital world and its negative impact, including the promotion of aggressive responses in children by playing aggressive/violent games, interference with psychosocial well-being, children's attention span and the potential for disrupted sleep (Wilhelm, 2016 & Eatough, 2022).

Some medications or illnesses: These might be used for thyroid dysfunction and iron deficiency, which are important for brain function. Due to low hormonal level the brain doesn't work as quickly and thus lead to memory problems, slower thinking and a lack in focus (Eatough, 2022).

Halt (2020) also included the following list which could contribute to concentration problems:

Attitude, self-concept, emotional control, vision and hearing problems, allergies or food sensitivities, general health, a lack of structure and organization these are all factors which could have an influence on concentration or focus in general and thus should be addressed when one looks at someone struggling to concentrate.

Children with Attention-deficit Disorder (ADD) show a degree of inattention and impulsiveness that is markedly inappropriate for their stage of development. Boys are affected twice as often as girls (Oswalt, 2021).

To be able to make an accurate diagnosis, according to the Child Mind Institute (2021), a clinician should collect information from various people who observed the child, including the parent, other caregivers, therapists and teachers. Parents and teachers should fill out a rating scale, to capture an accurate assessment of the frequency of symptoms. This behaviour has to continue over an extended period, and be observed in more than one setting, both at home and school, as an example. Other possible reasons for the behaviour should be carefully ruled out by a clinician.

2.8. FOUNDATION PHASE TEACHERS EXPERIENCES, PERCEPTIONS AND TRAINING WITH CONCENTRATION PROBLEMS IN THE CLASSROOM

According to Kern, Amod, Seabi and Vorster (2015), various factors play a role in the perception teachers have on concentration problems including stigma, experience, knowledge and prior learning. They suggest that teachers' perceptions with regard to concentration problems are relatively high in their classrooms. The Education White Paper 6 advocate that everyone should be included into the mainstream learning. This statement thus concur that teachers are the primary source for achieving the goal of inclusive education and more so the foundation phase teachers as they are the first to encounter learners with concentration problems. Challenges teachers face in the foundation phase are the management of learner support in overcrowded diverse classes. Marufu (2020) suggest in his study that teachers are expected to recognise and respond to the diverse needs of learners by ensuring quality education by implementing appropriate teaching and learning strategies, classroom management strategies and resources used. The Education White Paper 6 (2001) stated that special needs children should be supported by the District Based Support Team (BDST and the School Based Support Team (SBST). The school should also come up with school-

based support, subject specialists, and remedial teams to assist and help support learners by addressing the diversity in the classroom. Marufu (2020) furthermore, states that teachers in the foundation phase must undergo training and more so specialization courses in foundation phase and early childhood development. Tebid (2019) made it clear that before Inclusive Education was introduced, the responsibility of assisting learners with barriers to learning with special qualified persons employed either by educational support services or special schools. This led to the notion that teachers need training to enable them to become competent, confident, critical and well-informed corps. The researcher found in this study that teachers attend to training, workshops and seminars on a regular basis to assist them and train them to identify and assist learners with concentration problems or any form of barriers to learning that might occur. It was also evident that the majority of schools would have a working relationship with various therapist to support learners with barriers to learning and more so concentration problems thus referring for assistance. Teachers mainly would observe learners with concentration problems and then would refer to a remedial teacher or a relevant therapist which might include an occupational therapist or a speech therapist. Parents would also be informed to assist with the process, therefore various stakeholders take hands to support learners with concentration problems or other barriers to learning.

2.9. THE PARENT-EDUCATOR-LEARNER ROLE AND RELATIONSHIP

A classroom essentially consists of a teacher who teaches and learners who learn. Internal and external factors however, influence the simplicity of this relationship, which in turn affect the significance and excellence of the teaching and learning taking place. The time and effort spent in a classroom, is therefore insignificant unless the learners are learning (Brand, 2010). Teaching and learning has changed over the last few years and this educational environment is not confined to the classroom, but teachers encourage and extended teaching and learning to their homes and communities. Therefore, the role of teachers has changed into encouraging learners into becoming

lifelong students and learners. Teaching is recognized as one of the most challenging and respected career choices and vitally important to the social, cultural, and economic health of the nation (Lanier, 1997).

Lanier (1997) stated that thousands of teachers are rethinking every part of their jobs, their relationships with learners, colleagues and the community. In short, teachers are reinventing themselves and their occupation to better serve schools and learners. Cox (2020) made it clear that teaching is a highly sophisticated profession, whereby it regularly extends beyond academics. Primary school teachers are regarded as third parents in many ways, as they are contributing tremendously towards children's development and their experiences in their formative years. Experiences children experience in their formative years, often shape them into the person they become and teachers help in no small way to discover who that will be. It is therefore, important for teachers to be positive role models and mentors to their learners every day. Teachers in general, are regarded as parents to their learners and they treat their learners as they would they own. They thus develop a close relationship, and even if learners are close with their teacher or not, they probably respect and revere them much like they do their own parent or guardians. In some cases, teachers may be some learners' only mentor (Cox, 2020)

There should be a cordial relationship between parents, educators and learners, in order to create a positive conducive school environment. The parents, as the primary educators of their child, and the educator as secondary instructor, are mutually interdependent. The parent-educator relationship is therefore important for seeking the best for the learner (Badenhorst, Van Schalkwyk & Kruger, 1993).

Parents should be actively involved in their children's education, in order to create a conducive school environment, with the intention of improving the culture of teaching and learning. Good parent-educator communication is critical for improved educator-learner relationships. Jowett and Banginsky (1991) support this idea when they maintain

that the successful education of children is dependent on the full involvement of their parents.

The parent-learner relationship is founded on love, while the educator, as the secondary instructor, also displays love for the child (Badenhorst, Van Schalkwyk & Kruger, 1993). Mutual trust is also a particularly prominent feature of the relationship between the educator and the learner. Learners, knowing that educators trust them, will retain this trust, because it gives them a sense of security and confidence to accept challenges in life (Gouws & Kruger, 1996).

2.10. SUMMARY

Teaching and learning has changed over the years, from a 'show and tell' approach, just as medicine and medical procedures have changed. Children do not sit in a row at a desk and dutifully listen and record what they hear, but each child is given a rich, rewarding and unique learning experience. Learning and the educational environment is not confined to just a classroom, but rather extended into the home and the community and around the world (Lanier, 1997).

It takes a community to raise a child, as the literature review suggests. The community, parents and the teachers are all involved in the raising, teaching and learning of a child. Where a child grows up have a tremendous impact on their developmental milestones and if it is reached. This in turn will impact their concentration in the classroom, as well as in life. Concentration can have an impact on a person's life, as could the use of medication with various side-effects. With this being said, the researcher wishes to explore the influence of neurofeedback training on Grade R learners' concentration levels for school readiness in the next few chapters by starting with the method of how this will be done.

CHAPTER 3: RESEARCH METHODOLOGY AND PROCEDURE

3.1. INTRODUCTION

It outlines a mainly mixed-method research methodology, which includes some qualitative and quantitative aspects. The data collection instruments employed to explore the influence of neurofeedback training in Grade R learners' concentration levels in school readiness; Brain Gain Neurofeedback and TESCA on 4 learners from schools in Bloemfontein; interviews from the teachers teaching these learners and questionnaires on educators in schools in Bloemfontein; are discussed in detail. Measures that were taken to ensure validity and reliability, as well as ethical acceptability, are also discussed in this chapter.

3.2 RESEARCH PARADIGM

According to Maarouf (2019) and Kaushik and Walsh (2019), pragmatism can provide a 'philosophical justification' or be the 'philosophical partner' or the basic set of beliefs that guide the action and define the worldview of the researcher. Thus, pragmatism as a research paradigm, finds its philosophical foundation in the historical contributions of the philosophy of pragmatism and therefore embraces plurality of methods. This is based on the proposition that researchers use philosophical and/or methodological approaches, which would work best for the specific research problem being investigated.

Cohen et al. (2018) and Cordeiro and Kelly (2019) define 'pragmatism', in which research focuses on framing and answering the research question or problem, which is eclectic in its design, methods of data collection and analysis, driven by fitness of purpose and employing a flexible approach in solving research problems, as long as it supports using whatever research method 'works' (succeed) to answer the research questions or problems (Cohen et al., 2018 & Maarouf, 2019).

Aliyu, Singhry, Adamu and Abubakar (2015) identified that philosophy is a systematic examination of assumptions and common wisdoms that underlines thoughts and action. They identified four sets of assumptions related to what reality or knowledge is: Ontological (how to know if the research conducted is true), Epistemological (The value that went into the research), Axiology (How the research is written) and Methodology (The process that was used to complete the research). It is therefore important that the researcher understand the ontological and epistemological orientation within a research paradigm as it is able to determine the entire course of the research project. The research therefore in this pragmatic paradigm employed a mixed method approaches to this research project as the researcher want to make sure that this research was conducted independent, objective, reliable, and by being able to extend and add to existing theories or studies.

3.3. APPROACHES TO RESEARCH

This research employs a mixed method approach. A mixed method approach is referred to as collecting, analysing, and in some way integrating both quantitative and qualitative data in a single project (Leavy, 2017). Rather than restricting the opportunities for research by only utilising either qualitative or quantitative methods, a mixed methods approach provides researchers with a greater scope to investigate educational issues, using both words and numbers, to the benefit of educational establishments and society as a whole (Almalki, 2016). The mixed-method approach is increasingly acknowledged as the third methodology movement (Maarouf, 2019 & Kaushik & Walsh, 2019).

3.3.1. THE QUALITATIVE RESEARCH APPROACH

The qualitative research approach values an in-depth subjective experience of people and their meaning-making process. Thus, it is based on written or spoken narratives (Leavy, 2017). Qualitative researchers attempt to study human action from the insider's perspective. The main goal of research is defined as describing and understanding, rather than the explanation and prediction of human behaviour. According to McRoy

(1995:2009-2015), this method permits the researcher to focus attention at the studying of text, literature and the document analysis report, in order to accomplish specific goals and objectives. A collective document analysis approach, is employed for the qualitative section. It further allows you to explore key characteristics, meanings and implications of the case being investigated (McCombes, 2020).

3.3.2. THE QUANITATIVE RESEARCH APPROACH

Quantitative data, on the other hand, is based on the process of collecting and analysing numerical statistics, Bhandari (2020). The quantitative research method fits well with the aspects of a study that requires the collection and accurate processing of empirical data in order to accept or reject the proposed hypothesis (Bhandari, 2020). The quantitative approach focuses on quantifying constructs. The researcher uses quantitative measurement (i.e., assigning numbers to perceived qualities of things) to measure the properties of phenomena (i.e., people's attitudes about certain issues) (Babbie & Mouton, 1998; Creswell, 1994; Mouton & Marais, 1990). The goal of the quantitative approach is to provide a comprehensive overview of a representative sample of a large population.

According to Mouton and Marais (1990), this is the most appropriate approach when questionnaires are used to collect large amounts of data. Fouche and Delport (2002) add to this Sibanda's (2009) and Reid and Smith's (1981) interpretations of quantitative research that the role of the researcher is to be an impartial observer and that studies are mainly designed to answer specific questions or hypotheses, thus what the research intent to do with this research and therefore making use of the quantitative approach and more specific employing questionnaires. The procedures for data collection are determined in advance, and the questions and hypotheses remain constant throughout the study. The researcher would thus be able to construct questionnaires in such a way that the hypotheses remain constant throughout the study to determine if educators have a predicament with learners struggling with concentration problems in the

classroom, if they are knowledgeable with regard to neurofeedback and what their views are in terms of learners struggling with concentration problems and if they would be open to implement neurofeedback into the school system as a method to assist struggling learners if possible.

3.4. RESEARCH DESIGN AND STRATEGY

The research adopts an embedded convergent research design, whereby qualitative and quantitative research data are embedded in a design by employing questionnaires, a document analysis and a focus group interview. The process of the design was done by gathering the data from the questionnaires while the pre-test, Neurofeedback training and post-test took place. The Focus group interview only took place at the end of the research to determine if positive results yield.

3.4.1 THE QUALITATIVE RESEARCH APPROACH IN THE MIXED METHOD DESIGN

The document analysis was done by analysing a 6-page report received from the occupational therapist, whereby the data of the 4 learner respondents were captured. The cognitive evaluation was developed by a psychiatrist and a team of experts, specifically focusing on cognitive ability. This is the first step in the process of preparing a child for Grade 1. The focus group interview was done to determine if teachers of these learners could pin point if Brain Gain Neurofeedback yield positive results.

3.4.2 THE QUALITATIVE RESEARCH APPROACH IN THE MIXED METHOD DESIGN.

The quantitative research data are achieved by means of questionnaires and a cognitive evaluation, using TESCA (Test of Emotional Stability and Cognitive Stability) pre- and post-test and Brain Gain Neurofeedback Training (stimulus), conducted by a qualified occupational therapist. Survey research is thus the preferred method of investigation, as this study makes use of a population of 81 respondents and sets out to measure attitudes and orientations of the parties involved.

3.4.3 TESCA TEST AND BRAIN GAIN NEUROFEEDBACK TRAINING

A comparison document analysis was conducted, whereby two (2) learners received the TESCA test and the Brain Gain Neurofeedback Training and two (2) learners receiving the TESCA test, but not the Neurofeedback Training. These tests were done by a qualified occupational therapist. The researcher received a six (6) page report of the tests that were conducted and compared results with regard to concentration levels for Grade R learners' school readiness.

A focus group interview was also conducted, consisting of four educators from the schools where the learners who took part in this study, attend. The focus group interview was done to support the data collected from the six-page report, as well as the questionnaires from the teachers from various school in the Bloemfontein area. The educators were interviewed by using a Zoom meeting set-up, due to the influence of Covid-19 on personal contact, and each respondent was given the opportunity to voice his/her opinion with regard to aspects discussed in relation to concentration issues and Grade R learners' school readiness, as well as Neurofeedback. The questions used in the interview were derived from the quantitative questionnaires compiled, as well as the document analysis done with the two (2) learners receiving TESCA and Brain Gain Neurofeedback Training and two (2) learners only receiving TESCA and not Brain Gain Neurofeedback Training.

3.5. SAMPLING

3.5.1 POPULATION

The population involved are teachers from all Primary Schools in the Motheo District, in the Free State Province, South Africa, who were willing to take part in this study. The learner respondents were from the same school with the same teachers from a Primary School in the Motheo District, in the Free State Province, South Africa.

3.5.2 SAMPLING IN MIXED METHOD

The sampling for the mixed method approach utilizes a simple multi-stage purposeful random sample design, in turn indicating that the individuals representing the sample in two or more stages. The first stage is a random selection and the following stage is purposive selection of participants (Onwuegbuzie & Collins, 2007). Respondents are also ideally selected by means of randomized sampling methods (De Vos et al., 2011: [n.p.]). However, due to the sample size, the researcher selected a random sample to include all aspects of society. This was also done to minimize the occurrence of favouritism.

QUALITATIVE SAMPLING

The researcher used purposive and convenience sampling as techniques to select participants in this study. According to Cohen, Manion and Morrison (2018), purposive sampling referred to cases being handpicked to meet the specific needs of the research, on the basis of their judgement of the typicality or possession of the particular characteristics being sought, for this study the characteristics sought for the 4 learner respondents was that they are of same age, same school and same teachers. Convenience sampling refers to the selection of the nearest respondents or respondents whom are easily accessible to the researcher, thus this was done by allowing the occupational therapist to assist with the available learner respondent data. A convenience sample may be selected for a document analysis (Cohen et al., 2018). This sampling will be an advantage, because it provides the researcher with the justification to make summaries form the sample that is being studied, as the research can squeeze a lot of information out of the data collected. It also enables the researcher to describe the major impact these findings could have on the population in general (Sharma, 2017).

QUANTITATIVE SAMPLING

The researcher utilizes the simple random sampling method, which is based on simple randomization, as each person or sample unit in the population has the same known probability of being selected (Cohen et al., 2018). This sampling is beneficial, due to the fact of its representativeness of the population. It is also important to draw conclusions form an unbiased, random selection, which is a representative sample of a population (Sharma, 2017).

3.5.3 SAMPLE SIZE IN MIXED METHOD

QUALITATIVE SAMPLE SIZE

The qualitative sample size composes of four participants, such as two learners for the first set receiving Brain Gain Neurofeedback training, and two learners for the second set without the Brain Gain Neurofeedback Training. Four (4) Grade R learners from a school in Bloemfontein's urban area were selected for this section of the research. The sample size for this part of the study was determined by the comparable data the occupational therapist could assist with, as these studies are expensive and not all participant is of the same age, therefore these learner participant was chosen as they were available and willing to take part in this study as well as the fact that their characteristics were similar in terms of age, school and teachers to be able to have a fair, unbiased data set to draw conclusions form.

QUANTITATIVE SAMPLE SIZE

For this study a quantitative sample size of a 100 questionnaires were sent to schools in the Motheo District, but only 81 educators representing the foundation phase of schooling from Grade RR, to Grade 3 were able to partake in this study. These educators were from all the Pre-primary and Primary Schools in Bloemfontein. The respondents within the sample were chosen at random and consist of males and females between the ages of 20 – 65 years. Due to these participant's involvement with

the learners, they were able to provide reliable, data in order to determine whether concentration levels are a problem in the foundation phase of schooling.

Ravhuhali, Mashau, Lavhelani, Mudzielwana and Mulovhedzi (2020) state that foundation phase teaching is regarded as a female-dominated teaching profession. The researcher also found in this study that, 98.6% of the educators in this sample were female and only one male, reason being that society believes female teachers provide nurturing, motherly love and are soft by nature towards infants, compared to their male counterparts.

A study done by Mzoli, Ramsaroop and Petersen (2021), found that “foundation phase teachers’ views of the involvement of male caregivers in young children’s education” is that, educators have not considered the role of male caregivers in the foundation phase of children’s education, they acknowledge that such an undertaking would be beneficial to the learners and the school. These authors argued that fathers and father figures (male caregivers) have a positive influence on young children’s school outcomes in diverse contexts, which emerged over the last two decades. The data received from the questionnaires are discussed further in Chapter 4.

3.6. METHODS – DATA COLLECTION

This study uses both qualitative and quantitative instruments.

QUALITATIVE INSTRUMENTS

The emphasis of this research method is therefore on methods of observation and analysis. This includes examination methods, such as unstructured interviewing, participant observation, as well as the use of personal documents and literature reviews (Babbie & Mouton, 1998). This study employs a summative content analysis approach, this involves counting and comparisons, usually of keyword or content followed with the interpretation of the underlying context (Hsieh and Shannon, 2005). Data are collected by using documented data from the TESCA (Test of Emotional Stability and Cognitive

Stability) test and the Brain Gain Neurofeedback Training programme administered to two respondents. Thus this allowed the researcher to do an in-depth analysis to examine the similarities and differences of the several case studies being conducted (Backster & Jack, 2008). The document analysis information is drawn from, the report received from the qualified occupational therapist for each respondent. The occupational therapist would use a computerized program with a headset that would measure the learners' attention. The program monitors the learners' attention when they would watch a movie, as soon as they lose their attention/concentration than the movie would stop, it would only continue if the learners' attention is retrieved. The program thus measures the concentration levels and are measured against the learners age and gender. The TESCA pre-test determine the level at which the learner is and then Neurofeedback assist to train the brain to concentrate for longer periods at a time as the time frame of training the brain increases. The duration of the treatment would be determined by the level of the learners' concentration as well as their age, gender and concentration level compared to the normal ratio of peers. The TESCA post-test would then be done as soon as the training plan are completed, thus giving a comparison of the changes and progress learners made. These results are therefore given to the researcher by the occupational therapist in a six (6) page report. Interviews are also conducted to determine teachers' perceptions with regard to concentration levels of Grade R learners, as well as their views of Neurofeedback Training. A summative content analysis design is particularly useful to employ when there is a need to obtain an in-depth, multi-faceted understanding of a complex issue in its real-life context. Therefore, data was attained by means of a document analysis from the six-page report on each learner respondent's ability to concentrate and focus, as well as teachers' interviews. The results are discussed in Chapter 4.

The teacher interviews are used to find information that one would not otherwise be able to access; this research approach focuses on a small sample and respondents share their life experiences on a more intense personal level. (Babbie & Mouton, 1998;

Barbour & Kritzinger, 1999; Krueger & Casey, 2000). A focus group interview, consisting of four educators from schools where the learners receiving TESCA test and Brain Gain Neurofeedback training attend, is held. According to Babbie and Mouton (1998), focus group interviews are used to find information, which would not otherwise be able to access and each respondent have an opportunity to voice his/her point of view.

QUANTITATIVE INSTRUMENTS

This study employs the TESCA as instruments to collect quantitative data. The TESCA were conducted before and after the Brain Gain Neurofeedback Training programme were administered. The test was conducted by a qualified occupational therapist. The researcher draws and interpreted conclusions from the six-page report submitted by the occupational therapist, which is discussed in Chapter 4.

Since this study uses individual people as the unit of analysis, it pertains to the popularity of survey research (questionnaires) (Babbie & Mouton, 1998). A questionnaire method is also employed to gather data, relevant to the research questions. Structured questionnaires, comprising of close-ended and open-ended questions, are utilized to identify if concentration levels in Grade R learners' school readiness are problematic, as well as their perception of Neurofeedback training. Close-ended questions are queries where the respondent is asked to select an answer from a list provided by the researcher, thus ensuring that the researcher's data falls within the desired parameters. This would assist the researcher to determine specific information within the questions asked and possible answers provided as it is close-ended and thus consist of a specific selection or choice given by the researcher and therefore fall within a set parameter of information search for.

3.6.1. QUESTIONNAIRES FOR EDUCATORS

The contents of the questionnaires are based on possible questions to be asked about the prevalence of concentration problems that occur in Grade R learners for school readiness, how teachers identify these problems, how they treat concentration problem cases, as well as their development within this realm; e.g. educators call parents if they see concentration problems. The questionnaires also cover suggestions and ask for possible solutions by the participants of the effectiveness of these strategies to improve the concentration levels in Grade R learners' school readiness, by using open-ended questions.

The following categories are addressed through close-ended questions:

1. Demographic data,
2. Class composition,
3. Professional qualification and development.

3.6.2. EDUCATORS' PILOT STUDY

The group of 15 educators who chose to complete the pilot test were given explicit instructions to complete the questionnaire in as derogatory manner as possible. The selected educators were also knowledgeable that the purpose of them completing the document was not to obtain data, but to empower the researcher to improve, develop and make a more understandable, and reliable instrument for the gathering of data. Thus, the purpose of the pilot study was to obtaining feedback on; the general structure, user-friendliness, and design of the questionnaires; any language-related errors as well as the ambiguity and/or clarity of questions. This exercise led to constructive and expert feedback and numerous modifications were made, mainly editing and the clarification of questions, and streamlining the layout of the questionnaires. Examples of question changes and editing include: adding questions such as what the residential area is, what their main teaching subject is and do you think there is more children struggling with concentration problems, which was changed to do you think more, unidentified

children struggle with concentration problems? With these developments recognised, the questionnaire warranted that the main study was ready to be conducted.

3.6.3. DISTRIBUTION METHOD FOR EDUCATORS' QUESTIONNAIRES

The questionnaires were distributed via an online application called Jotforms, but the researcher struggled with participation by only using this platform and therefore went to schools and distributed questionnaires by hand and collected it after seven (7) working days. The initial distribution via the Jotform application was to reduce handling of paper due to the fact that the Covid-19 pandemic was still not over and to reduce possible infection spread the researcher, therefore made use of this method to observe protocol. The questionnaires where then sent to each educator to complete online. After completion they submitted it immediately and the researcher then had access to the questionnaires., With this step completed, the required data (from a quantitative perspective) were collected successfully.

3.7. DATA ANALYSIS

The researcher received a six-page report on each Grade R respondent's ability to concentrate and focus. Furthermore, the learner's motor skills were evaluated – this evaluation was developed by a kinder-kinetics and occupational therapist – to identify age appropriate underdeveloped motor skills (Goodway et al., 2021). According to Mauro (2022), motor development forms the basis of all the skills that children will need in their daily lives and thus in the classroom. The reality is that under-developed motor skills can be the real reason for learning impairments (Goodway et al., 2021).

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in their daily lives and thus in the classroom. The reality is that under-developed motor skills can be the real reason for learning impairments (Goodway et al., 2021).
A statistician was approached for the refining and analysis of data, after the quantitative data had been captured into a *Microsoft Excel* spreadsheet. Using a computer program called Python, the data were manipulated and analysed to the point where the data could be visually represented in graph form. These graphs, with their corresponding information, were then given to the researcher, who proceeded to interpret and draw conclusions from them, which resulted in descriptive statistics. The researcher used the questions in the questionnaires to determine the themes that could emerge and described the data as it emerged from there, thus the demographic information from the educator questionnaires, the class composition, the methods educators use to identify children with concentration problems, the knowledge educators have about neurofeedback, their professional qualification and development as well as suggestions educators might have on how learners' concentration levels could be improved for school readiness.

The qualitative data analysis was approached in a different manner. The data from the document analysis done, were a six (6) page report, received from the qualified occupational therapist for each learner who took part in this study. The researcher interpreted the themes that emerged from the report and compared the two report sets. These themes included the demographic information of the four learners, the TESCA pre-test to determine if these learners have concentration problems and on which level as it is measured against their peer level in terms of age and sex. Before themes were discussed the researcher made sure to disclose the terms that would be used to better understand the TESCA pre-test that was done as well as the values used against which it was measured. Themes that were discussed were the variable analysis of attention performance and response performance. The Brain Gain Neurofeedback program are also discussed and explained to better understand the comparison that took place

between the two learners receiving TESCA pre and post testing as well as the Neurofeedback training compared to the learners only receiving the TESCA pre-testing.

Data collected from the focus group interviews were interpreted in conjunction and incorporated with the data found from the document analysis, as the data collected from teachers were able to clarify, support and strengthen the results found from the document analysis and the results were then interpreted in an analytical framework.

Literature was also collected with regard to theories and aspects of concentration, child development, as well as neurofeedback, and the necessary inferences and conclusions drawn.

3.8 DATA VERIFICATION AND TRUSTWORTHINESS

The researcher employed a mixed method research approach in the form of an embedded convergent research design, thus implementing qualitative and quantitative research methods. In this study the data were collected by means of a document analysis, focus group interview and questionnaires. The researcher constructed the analysis on the hypothesis that collecting diverse types of data best provides a more complete understanding of a research problem than either quantitative or qualitative data on its own. The qualitative data received from the learner's six-page report are compared by using the report to determine if there are improvements in learners' concentration levels and also comparisons between the learners receiving TESCA and Brain Gain Neurofeedback, versus only the TESCA. The interviews of the teachers teaching these learners are analysed according to the themes emerging. By implementing various data gathering methods assisted to create a complete picture than a standalone qualitative or quantitative study, the researcher constructed the analysis on the hypothesis that collecting diverse types of data, best provides a more complete understanding of a research problem than either quantitative or qualitative data on its own. The data would therefore be more credible, because different methods

to collect data on the same subject were employed. The focus group interview converges with the data found in the document analysis, therefore strengthening the validity of the conclusions found in the study. This study would therefore be classified as trustworthy and verified as various and several data gathering methods were utilized to collect data on the same subject to find identifiable patterns or data sets. The researcher was able to draw meaningful interferences from results gained from the questionnaires, thus the findings are generalizable, because the questionnaires were constructed in a reliable and valid manner and the outcomes were met as intended to.

3.9. ETHICAL CONSIDERATIONS

Considering that this study worked with human test subjects, it is vital that the following ethical matters are addressed. The identities of participants and participating schools were kept anonymous to the extent that they were not required to provide any form of identification such as name, surname or identification documents. Permission to conduct the study was obtained from the Free State Department of Basic Education, the various primary schools' principals, participating educators, parents and learners. Parental consent was obtained, as learner participants are under-aged and consent was a requirement for the completion of the TESCA (Test of Emotional Stability and Cognitive Stability) and the Brain Gain Neurofeedback Training. Educator consent was also obtained and they had a choice to take part in this study, as it is not compulsory. Confidentiality of data is maintained throughout this research study. Permission was accumulated from the principals, as well as the educators, whereby their email addresses were collected in advance for the distribution of the questionnaires. Ethical clearance was also obtained from the Education Faculty at the University of the Free State. Respondents were allowed to withdraw at any stage during this study. A cover letter, containing a brief explanation of the purpose of the study, and a consent form are attached to the questionnaires. The consent form contains information to make sure the respondents understand that the data and information gathered are only used for study

purposes and are confidential. Thus, information would be kept secret and not be made available or known to anyone. That all respondents have the option to decline or withdraw from this research study at any given time. Educators and parents/guardians were given the opportunity to read and sign the consent forms to make sure they know and understand the background and rationale of the study before they sign the consent form. This research is and was done for study purposes only.

3.10. LIMITATIONS AND VALUE OF THE RESEARCH

One of the limitations of the study involves the limited scope of the participants involved. It is not practically feasible to conduct an empirical study of all schools in South Africa; therefore, participation is limited to Bloemfontein only. With this type of sampling, there is a slight chance of sampling error occurring. There are two types of sampling errors that might occur: systemic and random. The systemic type of error could be a result of bias and therefore not indicate the range of results for the entire study population. By carefully choosing the parameters of this study and defining the scope of research within the confines of the education paradigm, systemic error is virtually eliminated (Theofanidis & Fountouki, 2019).

Random error is the most frequent type of sampling error. It directly correlates with the sample size. It is observable that as sample size increases, random sampling error decreases. However, statisticians note that a carefully selected smaller sample group can be more accurate than a less-carefully selected large sample (Theofanidis & Fountouki, 2019). As the researcher carefully chose the participants for the study, it is believed that random error is not of any consequence to the outcomes of this research.

Regarding the limitation of the study as pertaining to the qualitative approach, one must consider that observing real people can make a big impact rather than simply reading quantitative data. Concomitantly, the researcher may ascribe quantitative analysis to the results, despite the small sample size. There is a tendency for researchers to only use

the results they deem significant, thus our assumptions often guide our perceptions, consequently, when we believe something, we tend to believe it even if it is not there. Our assumptions very often guide our perceptions, consequently, when we believe something, we tend to see it even if it is not there. This problem could be due to a conscious attempt to support our own views, thus known as confirmation bias, and when researchers tend to look for evidence that are right, they ignore contradictory evidence (Singham, 2020). Due to the subjective nature of focus groups, it may be difficult to interpret results. Focus groups also require skilled moderators to ensure unbiased and proper interpretation (Theofanidis & Fountouki, 2019). It is the intent of the researcher to remain as objective as possible to interpret the data without bias. By using inferential statistics, the researcher attempts to gain insight into what the respondents feel are important aspects with regards to concentration in schools, making it easier to interpret results. As the qualitative research is corroborated by the quantitative data, bias is limited.

From an educator's perspective, there is no doubt that child development and more specific the ability to concentrate, is one of the most indispensable features of life.

3.11. SUMMARY

Research methodology is the framework used for the planning, implementation and analysis of a research study. Thus, the proper choice of a suitable methodology can provide an effective and successful original research. In this chapter the researcher looked at the overarching strategy and rationale of the study to develop an approach that would suite the objectives of this study. This was done by choosing a mixed method approach by employing qualitative and quantitative research methods. A qualitative methodology is used to understand peoples' perceptions about the world around them or an event that took place, in contrast to this a quantitative methodology is typically used when the research aims and objectives are confirmatory in nature. By combining

these methods, the researcher was able to yield results which were reliable and unbiased as more research tools were implemented for this purpose.

CHAPTER 4: PRESENTATION AND DISCUSSION OF FINDINGS

4.1 INTRODUCTION

This chapter outlines the findings of the research project. Patterns that emerged from the close-ended questions are combined with responses from the open-ended questions, the focus group interview, as well as the result form the TESCA (Test of Emotional Stability and Cognitive Stability) (pre- and post-test) and neurofeedback training within specific categories. This provides for a rich, detailed and complexed amount of data and demands close reading.

4.2 FINDINGS FROM EDUCATOR QUESTIONNAIRES

4.2.1 DEMOGRAPHIC DATA

81 educator respondents took part in this study and were representative from schools located in Bloemfontein. 80% of the educator respondents were female and only 1% represented males. In this study the demographic evidences indicate that 80 educators in this sample were female and only one male.

These respondents reside in a distribution of the majority of the suburbs representing Bloemfontein, thus the study is therefore not limited to certain schools, but rather all schools willing to take part in this study. This is indicative of a more valid and reliable source of information as the researcher is not relying on a limited set of information and data.

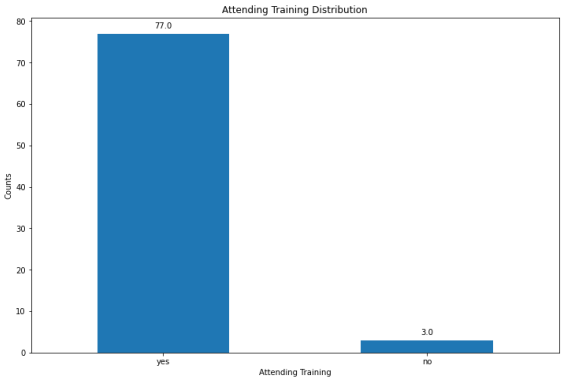
RESPONDENTS AGE DISTRIBUTION	%	RESPONDENTS QUALIFICATION IDENTIFIED	%	RESPONDENTS EXPERIENCE STATED	%
20 - 24 years	4%	High school graduate	8%	0 - 5 years	25%
		Vocational training	2%	6 - 15 years	21%
25 - 34 years	26%	Associate degree	5%	16 - 25 years	19%
35 - 44 years	24%	Bachelor degree	55%	26 - 35 years	10%
45 - 54 years	13%	Bachelor and Honours degree	3%	36 - 45 years	6&
55 - 65 years	14%	Master's degree	3%		

		Doctoral degree	1%		

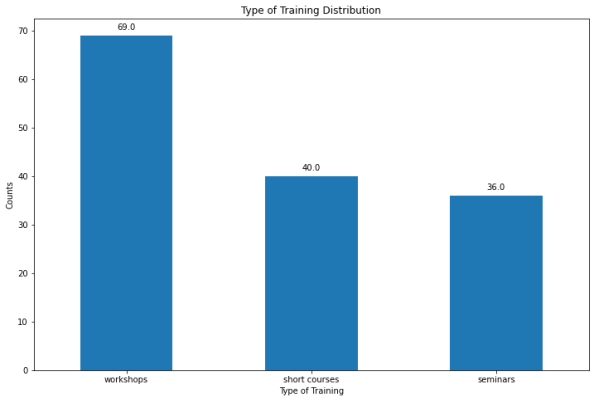
Table 4.1: Age distribution, qualification and experience tabled

This is indicative in table 4.1, that the majority of educator respondents were in their twenties to mid-forties, showing that they are at the age where they are intrigued and willing to take part and learn new strategies and trends.

As seen by the data presented in table 4.1, the majority of the educators have a vast amount of experience, knowledge and are subjected to continuous training and workshop, therefore making them adequate to be able to observe learners and identify them if they are struggling with concentration problems. These educators are thus knowledgeable and experts in their field.



Graph 1: Educator Attending Training Distribution



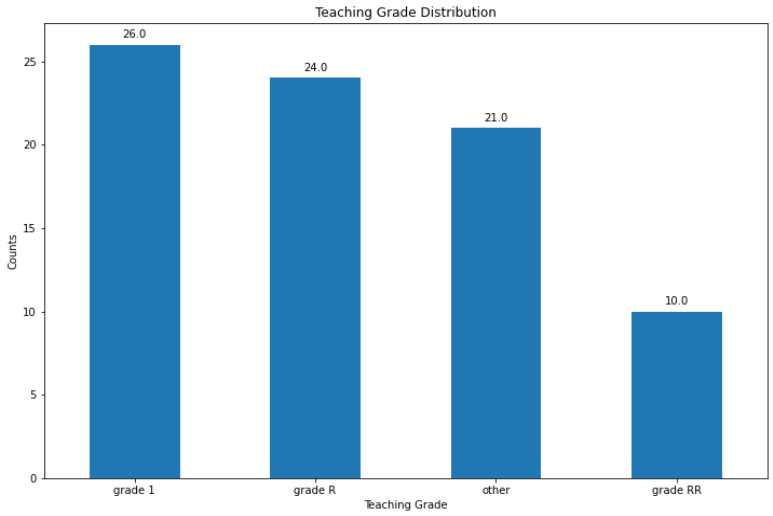
Graph 2: Educator: Types of Training Distribution

The training of the educator respondents specifies if they attend training or not. 77% of the educator respondents do attend training, while 3% do not attend training at all. The type of training the educator respondents are incline to attend were either workshops, seminars, short courses, etc. and 69% of the educator respondents attends workshops, 40% attend short courses and 36% attend seminars.

4.2.2 CLASS COMPOSISION

The teaching subject distribution is very interesting as it is indicative of the teaching grades taught by the educator respondents in this study. Learners in the foundation phase are referred to as Grade RR and Grade R and the rest would be representing Grades 1 up until Grade 3, where these learners are therefore taught mathematics 46%, Life Skills also 46%, Afrikaans HL 40%, English HL 26%, English

FAL 20% and Afrikaans FAL 4%. The difference in the codes for the Afrikaans and English would be indicative to the language in which the school represents these subjects; either Afrikaans First Additional Language or Afrikaans Second Language and the same for English.



Graph 3: Teaching Subjects Distribution

The educator respondents selected to participate in this research study, were mainly the foundation phase group, thus from Grade RR to Grade 3.

CLASS COMPOSITION OF RESPONDENTS	%
Grade RR	20%
Grade R	24%
Grade 1	26%
Grade 2 & 3	21%

Table 4.2: Class composition of respondents

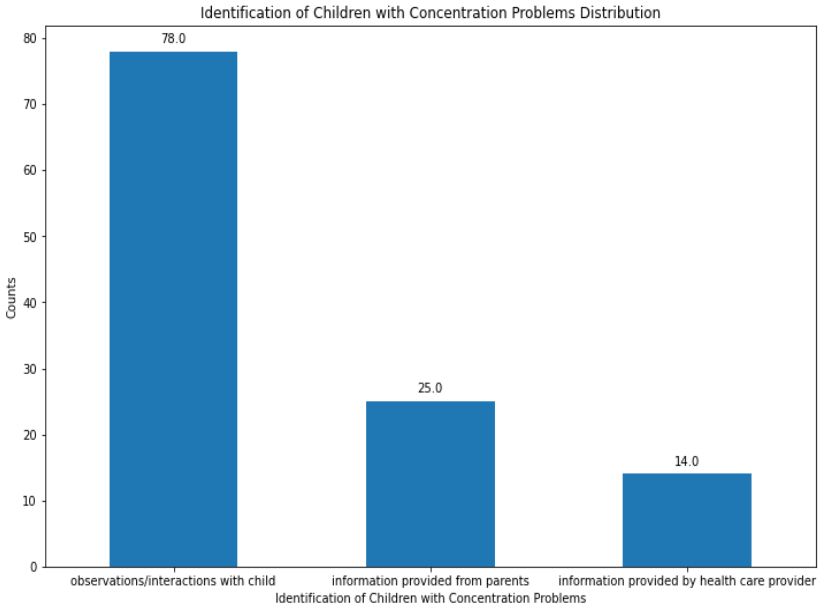
According to the data gathered by the questionnaires, the number of children per class would range from the minimum of 10 in a class to 40 learners per class. The average learners per classroom would be 25.

23% of the educator respondents teach a multi-grade class, meaning there are different aged children in the class and therefore make the identifying of concentration problems difficult, as all children are not

on the same developmental level in these classes. 58% of the Educator respondents were not teaching a multi-grade class. 58% of these educator respondents do not have disabled children in their classes, but 20% do.

4.2.3 METHODS USED BY EDUCATORS TO IDENTIFY CHILDREN WITH CONCENTRATION PROBLEMS

The educator respondents were asked in the questionnaire how they identify learners struggling with concentration problems and the majority used observations of children to identify those that might struggle with concentration problems in 78% of the cases, 25% identify learners with concentration problems from information provided by parents and 14% identified learners with concentration problems by information provided by their health care provider.



Graph 4: Identification of Children with Concentration Problems Distribution

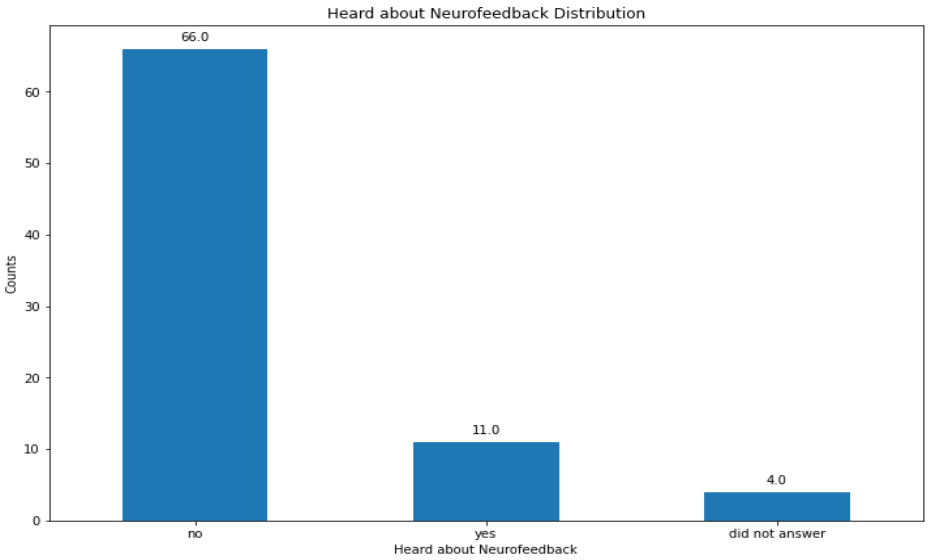
Educator respondents called in 62% of the time to inform parents about the problem, 44% were assisted by an occupational therapist, to help and address concentration problems and 31% only moved the learner to the front of the classroom to make sure there are less distractions for this child, 16% would send the child for remedial assistance at the school, 10% would send the child to the speech therapist for assistance, 6% indicated other, but did not specify what they would do and 1% of the educators indicated that there is nothing they could do for learners struggling with concentration

problems.

The extra support educator respondents rendered to learners with concentration problems varied from, 63% provided learners with individual support from the educator, 48% assisted the learners by sending them for remedial support supplied by the school, 20% assisted by providing physical adaptations in the school to assist these learners, 9% provided learners with specialized equipment at the school, 6% supported these learners struggling with concentration problems by sending them for remedial support outside of school time and 3% mentioned other, but did not elaborate on what they did to support learners with concentration problems.

63% of the educator respondents indicated that they saw significant improvements with learners with concentration problems when they used these interventions, 14% said they did not see any form of improvement, 3% did not answer the questions and 1% said they sometimes see improvements, but not always.

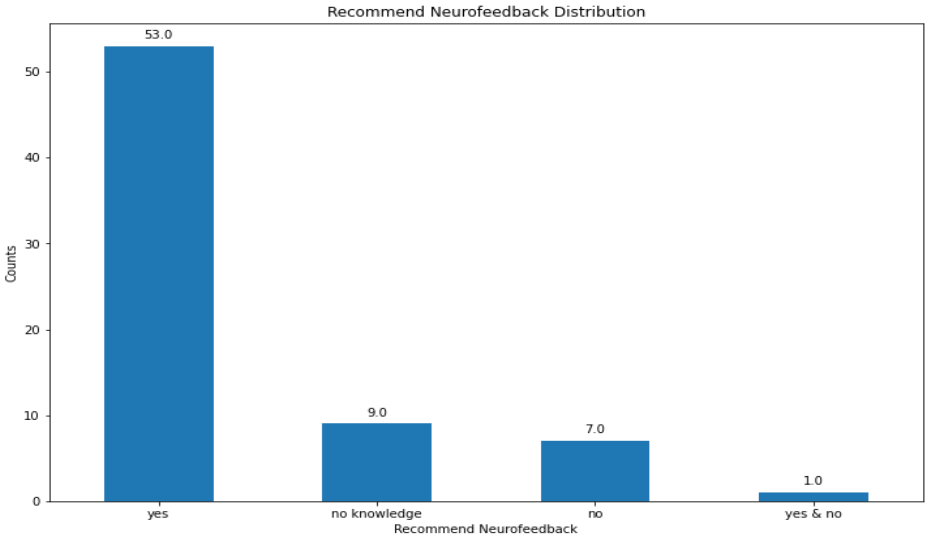
4.2.4 EDUCATORS' KNOWLDEGE OF NEUROFEEDBACK



Graph 5: Heard about Neurofeedback Distribution

Graph 5 represents if the educator respondents have ever heard about neurofeedback or not. 66% of the educator respondents that took part in this study have not heard about neurofeedback at all and a

further 4% did not answer. Only 11% of the educator respondents in this study heard about neurofeedback and had some knowledge about it.



Graph 6: Recommend Neurofeedback Distribution

Graph 6 shows if the educator respondents would recommend neurofeedback training in their classrooms. 53% of the educator respondents said they would recommend neurofeedback. The majority at 66% did not really know anything or have not heard about neurofeedback, but still would recommend it, thus indicating a desperation among educators with regard to learners struggling with concentration problems in school. 9% maintained that they do not have knowledge about neurofeedback and therefore would not be able to recommend it or not, 7% of the educator respondents suggested that they would not recommend neurofeedback as a means to support learners with concentration problems and 1% were undecided as they indicated yes and no to recommend neurofeedback training as a means in assisting and supporting learners with concentration problems.

According to the educator respondents that took part in this research study, 52% feel that there are more unidentified children that struggle with concentration problems, while only 10% stated that there are no more unidentified children struggling with concentration problems.

4.2.5 EDUCATORS' SUGGESTIONS ON HOW GRADE R LEARNERS' CONCENTRATION LEVELS COULD BE IMPROVED FOR SCHOOL READINESS

Educators had various suggestions and opinions on how concentration levels for Grade R learners could be improved for school readiness. The majority agreed that physical activities whereby play are incorporated are the best way to improve concentration levels. They also stated that concentration activities, reading books and playing games that stimulate their minds and challenging them, can also assist in improving concentration. Some educators said that they give children body breaks during the work day which assist them to concentrate on their work and perform better. Educators also agreed that routine assisted with concentration, one-on-one activities, multisensory activities incorporated into their daily activities, but physical play according to them have a major impact on children's development as a whole, but mostly on their concentration. They also suggested that parent involvement played a tremendous role in better performance and concentration levels.

4.3 FINDINGS FROM TESCA (TEST OF EMOTIONAL STABILITY AND COGNITIVE STABILITY (PRE- AND POST-TEST) AND NEUROFEEDBACK TRAINING.

4.3.1 TESCA (TEST OF EMOTIONAL STABILITY AND COGNITIVE STABILITY) EXPLAINED

The TESCA is a computerized test of continuous visual attention performance. The normative data against which individual TESCA performances are measured, was established in large samples of children and adults in South Africa when this program was tested. The TESCA can be used to test attentional performance for diagnostic purposes and to evaluate the effects of treatments. Four respondents were used in this experiment whereby two respondents only did the TESCA pre-test and the other two did TESCA pre- and post-test with neurofeedback training.

4.3.2 DEMOGRAPHIC INFORMATION OF THE FOUR LEARNER RESPONDENTS

The learner respondents were all age five years old, and therefore created a valid and fair comparison. They all received the TESCA pre-test which was a screening test to determine if learners struggle with concentration problems, but only two continued with the Neurofeedback Training as well as a TESCA post-test, below are the details of each respondent are discussed. The demographic discussion below is done as per the 6-page report done by the occupational therapist as an overview whereby a

thorough discussion will follow with a table with the four learner respondents test result details as received.

Learner respondent 1: Age 5 years, received the TESCA and the Neurofeedback Training. Overall, the first TESCA is suggestive of an irregularity in attention ability. The test results were not within normal limits. Emotional stability: 100% although marginal, the concentration deviation coefficient achieved in this test was slightly outside the norm (should be 5 or higher but was 3.34) for the particular age group and gender.

Learner respondent 2: Age 5 years, also received the TESCA and the Neurofeedback Training. The first TESCA results for learner respondent 2 is similar to Learner respondent 1, it is also suggestive of an irregularity in attention ability and the test results were not within normal limits. Emotional stability: 88%; the concentration deviation coefficient achieved in this test was also slightly outside the norm (should be 5 or higher but was 3.57) for the particular age group and gender.

Learner respondent 3: Age 5 years, only received the TESCA test. Overall, the TESCA was suggestive of an irregularity in attention ability and the results were not within normal limits. Emotional stability: 100% and cognitive school readiness: 67%. The concentration deviation coefficient achieved in this test was like the previous respondents' slightly outside the norm (should be 5 or higher but was 3.67) for the particular age group and gender.

Learner respondent 4: Age 5 years, also only received the TESCA test. Overall, the TESCA was suggestive of an irregularity in attention ability and the results were not within normal limits, similar to learner respondent 3. Emotional stability: 82%; the concentration deviation coefficient achieved in this test was like the previous respondents' slightly outside the norm (should be 5 or higher but was 3.83) for the particular age group and gender.

4.3.3 LEARNER RESPONDENT RESULTS PRE-TEST TESCA

4.3.3.1 Variable Analysis: Attention Performance

To better understand the result of the four learner respondents in this research, one needs to understand the term 'standard deviation'. These results, compared to the normal same-gender, same-age, and average intelligence group, are known/reported as standard deviations and standard scores, where 0 represents the norm. The higher the score (toward the outer portion of

the chart), the better. The lower the score, the larger the likelihood of a problem. Normal results for standard deviations are -1.00 or higher (more positive).

LEARNER	OMMISSION	COMMISION	D-PRIME
Learner respondent 1	was not within normal limits, -2.757.	was within normal limits, -0.697.	was not within normal limits, -2.28.
Learner respondent 2	was marginaly just outside the normal limits, -1.485	was also within normal limits, -0.221	was marginaly just outside the normal limits, -1.435
Learner respondent 3	was not within normal limits, -1.92.	was within normal limits, -0.518	was marginaly just outside the normal limits, -1.449
Learner respondent 4	was also not within normal limits, -1.669	was not within normal limits, -1.822	was not within normal limits, -2.208

Table 4.3: TESCA results summary Attention performance compiled by researcher

As seen by the data represented by these four learner respondents, they all have struggled with accuracy, some also had problems with attention, but they did not have problems with impulsivity. Therefore, it was clear that Neurofeedback Training would have been recommended as a treatment plan to all four learner respondents.

4.3.3.2 Variable Analysis: Response Performance

Response time – measurement of reaction speed. It indicates the time taken to respond to a target. The lower the time, the higher the score.

LEARNER	RESPONSE TIME	RESPONSE VARIABLITY
Learner respondent 1	was within normal limits, -0.604.	was not within normal limits, -1.941.
Learner respondent 2	was marginaly just outside the normal limits, -1.395	was not within normal limits, -2.61
Learner respondent 3	was within normal limits, -0.637	was not within normal limits, -

		2.086
Learner respondent 4	was within normal limits, 0.898	was marginaly by only 0.162 just outside the normal limits, -1.06

Table 4.4: TESCA results summary Response performance compiled by researcher

Response variability – measurement of consistency. This indicates the consistency of reaction time throughout the test. The more constant the reaction time, the higher the score.

Each learner respondent's concentration deviation coefficient is discussed as it represents their overall performance during the test. A CDC-Score of 5 or less (more negative) is considered below the expected value for the particular age/gender group. A CDC-Score of more than 5 (more positive) is considered normal. When comparing CDC-Scores (such as with medication challenges), the higher the score, the better the performance. Thus, this score can be used as an indicator of response to treatment.

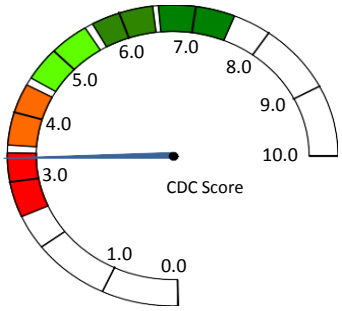


Diagram 1: Learner respondent 1 CDC score

Learner respondent 1; CDC score 3.34: this is indicative that the test results are not within normal limits, therefore the TESCA is indicative of an irregularity in concentration ability. A typical treatment protocol followed for this learner respondent in his/her age group and performance level is:
Sessions 1-8 7 minutes; Sessions 9-14 11 minutes; Sessions 15-19 16 minutes; Sessions 20-24 20 minutes and Sessions 25-48 20 minutes.

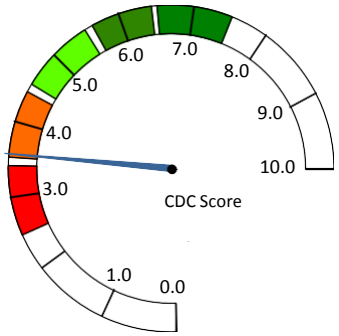


Diagram 2: Learner respondent 2 CDC score

Learner respondent 2; CDC score 3.57: this is similar to learner respondent 1, indicating that the test results are not within normal limits, therefore this learner also has difficulty in the ability to concentrate. The same treatment plan would be applicable as Learner respondent 1 seen above.

Both learner respondent 1 and 2 will continue with the Neurofeedback Training and results will be discussed below in the chapter.

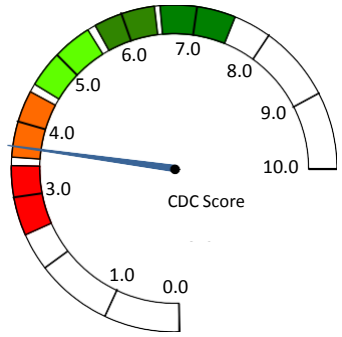


Diagram 3: Learner respondent 3 CDC score

Learner respondent 3; CDC score 3.67: the test results for learner respondent 3 are also indicating that the results are not within normal limits and this candidate would also have difficulty in the ability to concentrate. The same treatment plan would be applicable, but this learner respondent will not continue with the Neurofeedback Training.

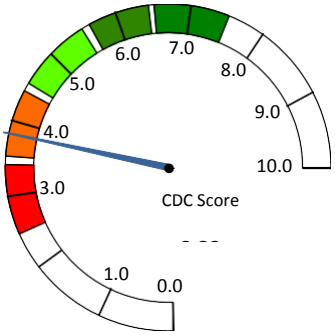


Diagram 4: Learner respondent 4 CDC score

Learner respondent 4; CDC score 3.83 had similar test results as the previous leaner respondents in this study. This indicates that the test results are not within normal limits and that this respondent would also struggle with the ability to concentrate. This respondent would also however be a candidate for Neurofeedback Training, but would not continue at this stage of the study.

In this result set of the four learner respondents it is clearly observed that all four struggle with the ability to concentrate and that they all are candidates to take part in the Neurofeedback Training, but however, for the purpose of this research, only the first two respondents continued with Neurofeedback Training.

4.3.3 TESCA COMPARISON RESULTS (AFTER BRAIN GAIN NEUROFEEDBACK TRAINING RECEIVED)

The same terms are applicable as explained with the pre-test of TESCA (Test of Emotional Stability and Cognitive Stability); these results are however compared with the pre-test to see if there are difference observed with the two learner respondents that received the full training course as recommended by the pre-test.

The result of the TESCA (Test of Emotional Stability and Cognitive Stability) (post-test), after Brain Gain Neurofeedback Training Program was completed, will be discussed using the above mentioned terminology.

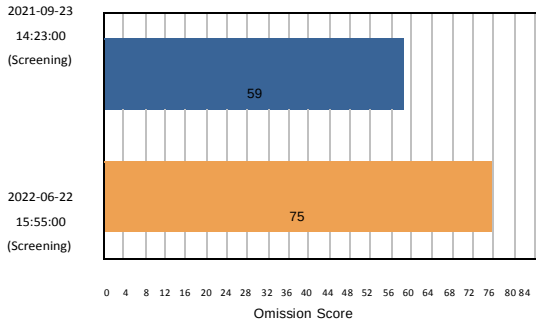


Diagram 5: Learner respondent 1 Combined Omission score

The omission results for learner respondent 1, in the combined report after Brain Gain Neurofeedback training was done with learner respondent 1. There was a notable decline in the amount of omission errors in the test. This indicates a significant improvement in attention ability. The omission score for learner respondent 1 were -2.757 and changed to -1.664, which is still not within the normal limits, but improved dramatically.

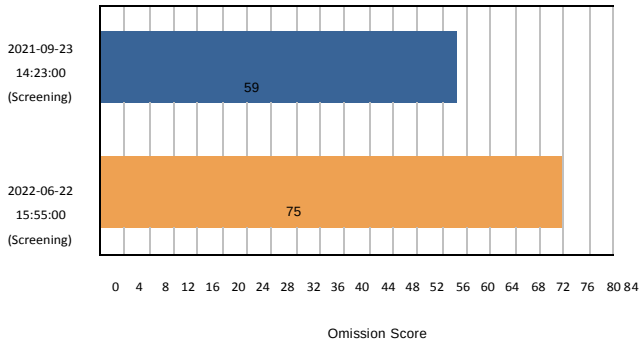


Diagram 6: Learner respondent 2 Combined Omission score

The omission results for learner respondent 2 after Brain Gain Neurofeedback training was done, were -1.485 and improved to 0.814, which are within normal range. Notable decline in the amount of omission errors can be seen, thus an indication of significant improvement in the learner's attention ability.

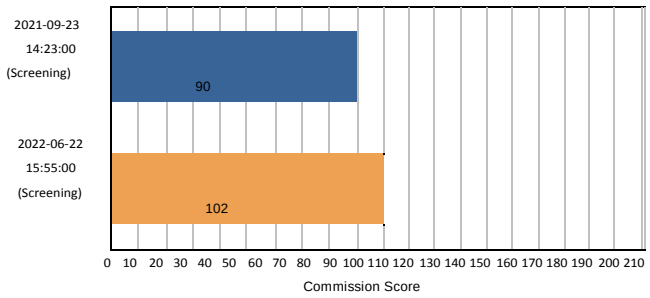


Diagram 7: Learner respondent 1 Combined Commission score

Diagram 7 indicate that learner respondent 1 had a decline in the number of commission errors indicating that there is an improvement noticed in the impulsivity. The first test score was -0.697 and it improved to 0.146, which is within the normal limit.

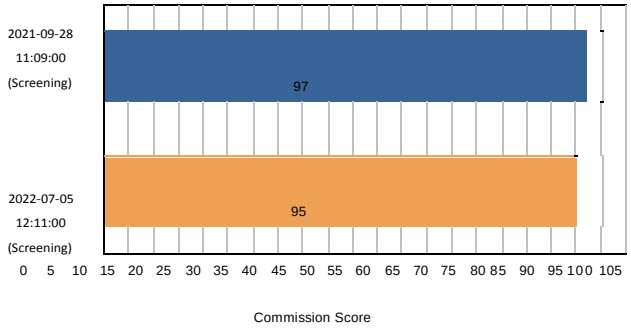


Diagram 8: Learner respondent 2 Combined Commission score

Learner respondent 2 showed a marginal increase in the amount of commission errors in the test. This could indicate a worsening of the level of impulsivity. Diagram 8 shows the initial score as -0.221 and the current score is -0.311, which is still within normal limits for the learners age group.

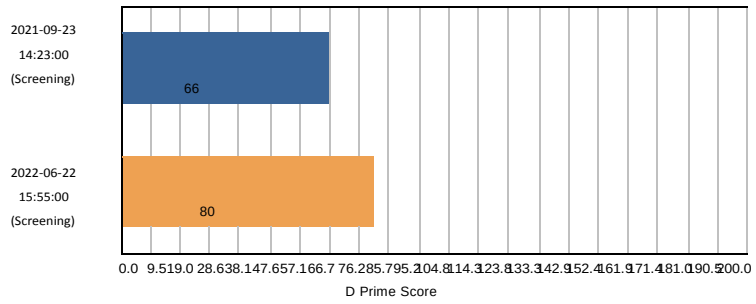


Diagram 9: Learner respondent 1 D Prime score

The results of learner respondent 1, showed notable improvement in terms of signal detection ability in the test. This indicates a significant improvement in the level of accuracy of the candidate. Learner respondent 1's current status is -1.311, and it is just outside normal limits and when compared to the first test, which was -2.28, thus, there was a significant improvement seen.

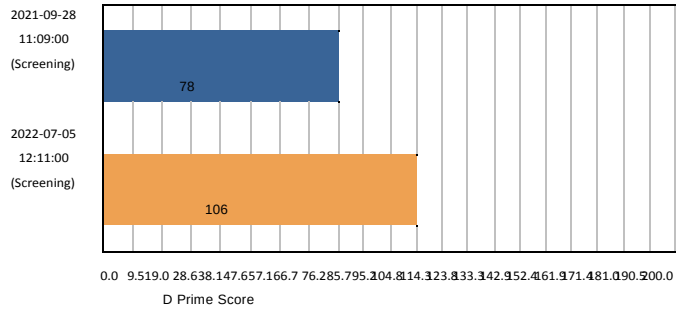


Diagram 10: Learner respondent 2 D Prime score

Learner respondent 2's results showed notable improvement in terms of the signal detection ability in the test. The current status is 0.401, which is within the normal limits and the first test was -1.435, a significant improvement as well.

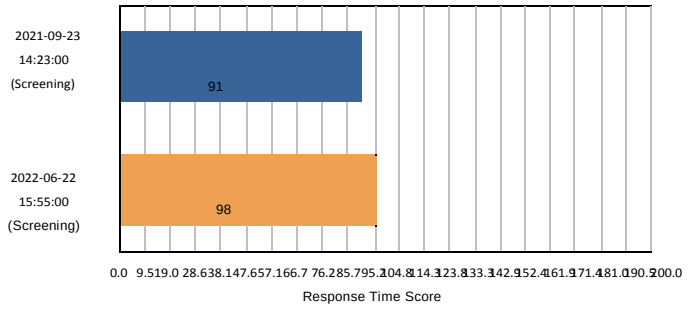


Diagram 11: Learner respondent 1 Response Time Score

Learner respondent 1 had a marginal improvement in terms of the time it took to respond to targets in the test. This indicates a minimal improvement in the level of responsiveness of learner respondent 1. The current status is -0.126, which is within normal limits compared to the first test -0.604, thus, an improvement was seen.

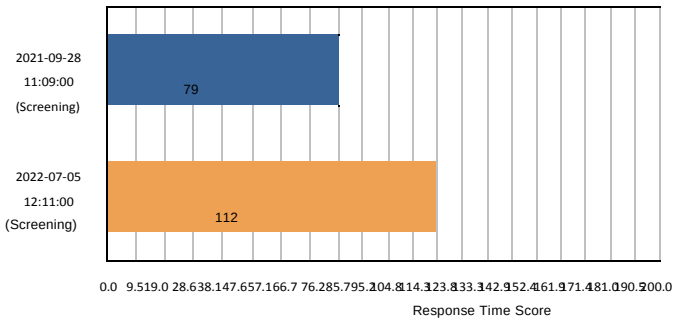


Diagram 12: Learner respondent 2 Response Time Score

The results of learner respondent 2 also showed notable improvement in terms of the time it took to respond to targets in the test. The first results were, -1.395 compared to the current status of 0.774, which is within the normal limits. There was thus a significant improvement in the level of responsiveness.

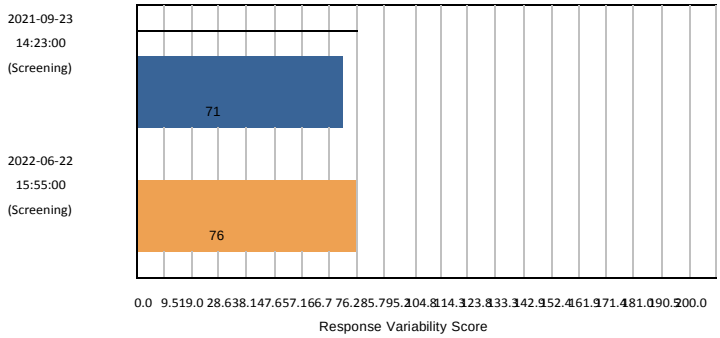


Diagram 13: Learner respondent 1 Response Variability Score

Learner respondent 1 showed marginal improvement in terms of the consistency of reaction times in the test. The current status is -1.633 compared to the first test, which was -1.941, thus indicating a marginal improvement in the level of responsive stability.

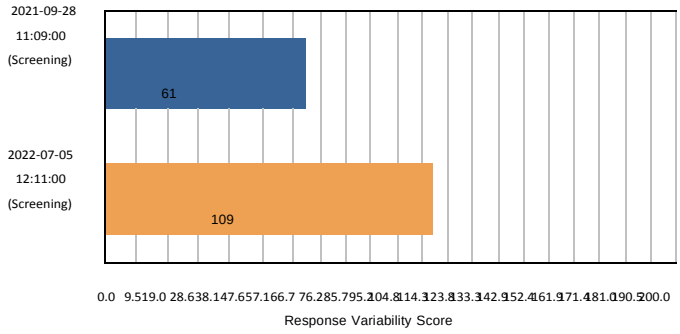


Diagram 14: Learner respondent 2 Response Variability Score

The result of learner respondent 2 showed notable improvement in terms of the consistency of reaction times in the test. The previous results were -2.61 compared to the current status of 0.601, which is within normal limits. This indicates a significant improvement in the level of responsive stability.

The Concentration Deviation Coefficient (CDC) is an indication of the learners' overall performance in the test. In Diagram 15 below is a comparison of the CDC scores of learner respondent 1. The CDC score for this learner should be 5 for their particular age/gender group. The higher the score, the better

the performance. Comparing the result from the first and last test, learner respondent 1 has shown improvement in all aspects of the test. There has been significant increase in performance in each of the 5 concentration indicators.

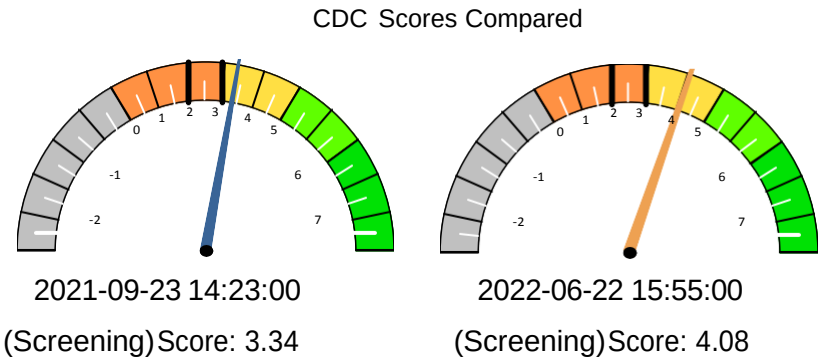


Diagram 15: Learner respondent 1 Concentration Deviation Coefficient

Comparing the results from the first and last tests, the overall results are positive for learner respondent 2. Although there are some areas in which improvement was not visible, there has been a notable increase in performance in 4 of the 5 concentration indicators for learner respondent 2 as seen in Diagram 16 below.

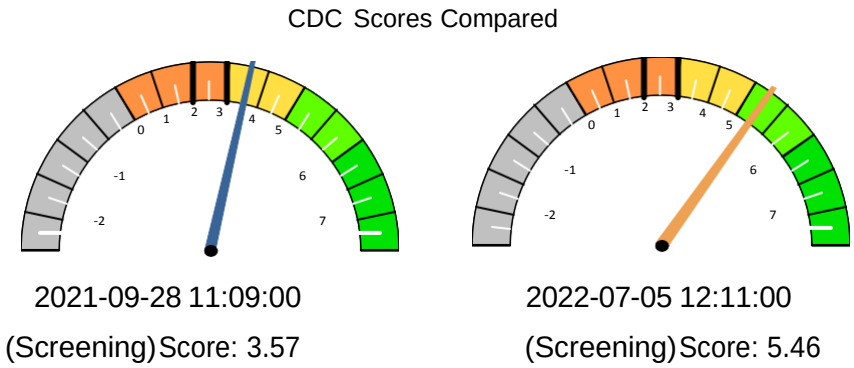


Diagram 16: Learner respondent 2 Concentration Deviation Coefficient

The results found from the TESCA and the Brain Gain Neurofeedback Training done by the two learner respondents in this study showed a significant improvement in these learners'

concentration levels. This was confirmed by the focus group interview held with the teachers in which these learners attend classes. The results according to the teachers are significant and they are referring other learners struggling to also go through Brain Gain Neurofeedback Training and Assessment. The results are better than any other assisted methods previously used, including various therapies or extra classes/remedial. Therapies are still needed for other problems identified in the classroom, but according to these teachers, specifically concentration levels improve with neurofeedback.

4.4 FINDINGS FROM FOCUS GROUP INTERVIEW

The focus group interview consisted of three teachers. These teachers were selected on the basis of being the teachers of the learners attending the TESCA and neurofeedback training. Feedback from these teachers were as follows: they thought that concentration problems increased specifically after the Covid-19 pandemic, and they thought that reasons for that would be that children were allowed to have more screen time and that some do not have space to play outside; to be able to climb, run, jump and play freely. In their schools they have remedial teachers assisting the learners struggling with learning. The teacher in which class the learners were that attended the Brain Gain Neurofeedback Training was very excited about it, as she experienced changes in both children and she could see that they were able to sit still for longer periods of time and be able to concentrate on the work being done. She also confirmed that all children she would identify, would immediately be referred to the occupational therapist in Bloemfontein that conducts Brain Gain Neurofeedback Training as the results yielded such positive feedback and improvement in these children. She definitely recommended Brain Gain Neurofeedback Training and was very excited, as the results were amazing, according to her. These teachers did know about neurofeedback training as this was not their first encounter as learners in other classes did attend, but she said this time around it was her first direct encounter with Brain Gain Neurofeedback Training and she said she had already identified other learners, whom she would refer. The learners that yielded these result were in Grade R and would be advanced to Grade 1 at the beginning of 2023. The teacher also said that she was very excited to see the changes that had happened in these children from rowdy, “naughty” children to children who are able to sit still for longer periods of time, while working and being able to reach success within the first try, as they are able to concentrate and understood what was expected of them. At first, they were not able to start a task

without asking repeatedly what was expected, as they were not able to understand at first, because they did not concentrate on the teacher who gave the tasks. She stated that the preparation for Grade 1 would also be easier as they were able to do as instructed and were able to sit still for longer periods. These teachers agreed that all schools should adopt or implement Brain Gain Neurofeedback Training into their schools, as the results were amazing and the experience gained from the teachers' perspective and the changes seen in these learners, were life changing.

4.5 RESULTS DISCUSSION

The analysis of the quantitative and qualitative data gathered from the questionnaires, the TESCA, Brain Gain Neurofeedback Training and the focus group interviews, prove that foundation phase learners struggle with concentration problems. The main focus of this research is to explore the influence of neurofeedback training on Grade R learners' concentration levels for school readiness. The demographic information in this study shows that educators in this study are representative of the Bloemfontein area as a whole. The majority of educator respondents were in their twenties to mid-forties, showing that they have experience and are at the age where they are intrigued and willing to take part and learn new strategies and trends. The majority of the educator respondents were female. Ravhuhali, Mashau, Lavhelani, Mudzielwana and Mulovhedzi (2020) state that foundation phase teaching is regarded as a female-dominated teaching profession. In this study, the demographic evidences indicate that 98.6% of the educators in this sample were female and only one male, the reason being, according to Ravhuhali, Mashau, Lavhelani, Mudzielwana and Mulovhedzi (2020), that society believes female teachers provide nurturing, motherly love and are soft by nature towards infants, compared to their male counterparts. A study done by Mzoli, Ramsaroop and Petersen (2021), found that "Foundation phase teachers' views of the involvement of male caregivers in young children's education" is that, educators have not considered the role of male caregivers in the foundation phase of children's education, and they acknowledge that such an undertaking would be beneficial to the learners and the school. These authors argued that fathers and father figures (male caregivers) have a positive influence on young children's school outcomes in diverse contexts, which emerged over the last two decades. Thus, male educators in the foundation phase should therefore be promoted and supported for the positive support it could yield in a broken society.

The class composition and teaching subject distribution in this study are indicative of the concentration problems that teachers are struggling with. The participants or educator respondents are mainly the foundation phase of teaching and learning, thus from Grade R to Grade 3, as the data suggested. The study aimed at this age group, specifically to explore if neurofeedback training have an influence on Grade R learners' concentration level for school readiness. Therefore, it was imperative to recruit educators teaching these Grades on their experience in terms of if concentration problems exist and how they identify them and also deal with them. According to the data gathered by the questionnaires, the number of children per class would range from the minimum 10 in a class to 40 learners per class. This would also have an effect on identifying and have an effect on the reason why some learners with concentration problems go unnoticed or slip through the cracks. The average learners per classroom would be 25. Some educators taught a multi-grade class, meaning that different Grades and ages were taught in the same class, therefore identifying concentration problems difficult, as not all children are on the same developmental level in these classes, but mostly the educator respondents taught same aged children in a class. The 20% of educator respondents that reported that there were disabled learners in their classroom, varied. The disabilities were specified by these educators from dyslexia, hearing problems, wearing glasses, deformities in hands, weak shoulders, ADD/ADHD, learning difficulties, autism, spina bifida, dyspraxia, cerebral palsy, developmental delays, aphasia and epilepsy. Teaching in a mainstream school with learners struggling with disabilities could be challenging and educators could struggle to keep up trying to teach these children without support. Therefore, parents, teachers, the Department and therapists should take hands and support each other to include these learners in all teaching and learning activities to the best of their abilities and help them to become a holistic, well-developed individual to have a positive input on the economy of South Africa.

The educator respondents' way of identifying learners with concentration problems were made clear in this study, whereby the majority would use observation as the main tool to identify struggling learners and they all would contact these learners' parents with regard to the problem. The majority would also assist learners with concentration problems individually, as well as send them for assistance to the remedial teacher if they are available at their school. They commonly agreed that they saw significant improvements with learners with concentration problems, when they used these interventions. The psychosocial theories discussed in this study; namely Skinner's Operant Conditioning and the

Pavlovian Classical Conditioning Theories, have an influence on the understanding of how neurofeedback is implemented. Skinner's Operant Conditioning is regarded as the main learning mechanism in self-regulation of brain activity through neurofeedback (Enriquez-Geppert, Huster & Herrmann, 2017). In short, operant conditioning states that the probability of a future response would depend on the immediate consequence which followed; positive consequences increase the likelihood of a given behaviour and vice versa. In retrospect, changing the brain's activity through such conditioning is not actually new (Enriquez-Geppert et al., 2017). Pavlovian Classical Conditioning acknowledges self-regulations as a skill, therefore not only operant conditioning, but also classical conditioning has to be taken into account (Strehl, 2014). The neurofeedback training programme: Brain Gain is a programme where real results and physical change in the brain cement this process of self-regulation/training the brain to concentrate and leads to long-lasting results, unlike medication, which wears off after a few hours.

As mentioned in the study, the frontal lobe is the part of the brain that controls high level cognitive skills and primary motor functions (Sendic, 2022). It is essential to recognize that many learning, behaviour, and neurological problems, such as Attention Deficit Hyperactivity Disorder (ADHD), are demonstrated by brain scans to have a generally low amount of oxygenated blood in the frontal lobe (Tan et al., 2020; Amen, Henderson, & Newberg, 2021). Brain Gain uses a system of feedback by keeping track of and determining the amount of healthy oxygenated blood going to the frontal lobe and helping the participant refocus when their mind strays through Neurovascular Coupling. Without proper blood flow, it is hard for people to take advantage of the activities regulated by that area of the brain, which could be seen in symptoms such as lack of concentration, impulsive behaviour, restlessness, difficulty following directions, and the inability to finish tasks.

In our present days, we are surrounded by a lot of activities and technology (including online teaching and learning) that have a detrimental effect on our brains and make us inclined towards diversion, immediate pleasure and social naïveté. Moreover, other external aspects, such as lack of physical activity (video games cannot be considered as a type of exercise and online teaching and learning) and an unfavourable diet (the financial constraints due to Covid 19) contribute to the fact that many children find it difficult to cope with a school environment that necessitates attention, focus and appropriate behaviour. It is possible that not all kids who struggle to concentrate or to do their homework suffer

from ADHD, nor do all of them require medication. We can prevent over-prescription of drugs with a natural, affordable and drug-free approach, such as Brain Gain, teaching the brains that never learned how to do so. As this study is close to my heart, being a mother of an ADHD child, who is also on prescription medication, as he really needs it, but he did Brain Gain Neurofeedback Training and the results were promising, therefore the interest and almost an urgency to do research on this topic. This research should be shared with the world as it is life-changing for school going children struggling with concentration difficulties. This is the answer to many concentration stumbling blocks for those affected after Covid-19, more so than ever. According to Soudien, Reddy and Harvey (2021), Covid-19 has laid bare once again both the inequalities in provisions needed to continue learning from home - such as funding, digital devices and data, adequate nutrition; as well as the disparities in how well teachers, learners, and parents have been equipped to do so. These researchers acknowledged that many countries struggle with this divide, but South Africans are different in their experience, because of their fragile education system and its capacity to deal with shocks such as Covid-19. With the slow improvement and gains after the Apartheid era, it is not clear if the system is able to sustain the gains made over this period of time. Soudien, Reddy and Harvey (2021) state that in response to the pandemic, the government has struggled to simply keep the system operational. These researchers projected by using the TIMMS (Trends in International Mathematics and Science Study) data that the country is in danger of being set-back in its improvement trajectory by five years, even as the first attempt at making sense of the Covid-19 educational experience reveals; the South African educational system and the most prevalent educational approaches being implemented are not sufficiently robust and innovative to deal with stabilizing the system, let alone the challenges of innovating towards greater quality. A research report done by UNICEF (Fricker, 2021) suggests that South African school going children are one full education year behind with teaching and learning, thus Brain Gain Neurofeedback could be the solution to alleviate one area/step for the education system, but can be one giant leap for mankind/children of today.

The aim and in a way, the purpose of this study, is to determine and explore if neurofeedback training could have an influence to assist Grade R learners' concentration levels for school readiness. The improvements noticed by the educator respondents would be improvement in learners' work, improvement in the time it takes learners to complete the tasks allocated, concentrating for longer periods at a time, working with more confidence, self-esteem improvement, interacting better with other

learners, feeling more secure, safe and loved and the educator respondents also noticed that learners sit still for longer periods at a time and do not fidget that much.

The study indicated as the results were analysed that the educator respondents mainly did not know about neurofeedback training or had any idea what that is. They all were exceptionally curious to know what it is and were excited to learn about it, specifically if it could and would assist those helping learners, who struggle with concentration problems. The knowledge of the few educator respondents, who did elaborate on their knowledge of neurofeedback, stated that it has something to do with testing the ability to concentrate using a computer programme, exercising the brain as a muscle, teaching and training the brain to concentrate and that it helped with ADHA and that the treatment changes the brain's response to a certain stimulus. It could be seen in their response that their knowledge about neurofeedback were not a true reflection of what it really entails. Although they did not really know and comprehend what neurofeedback training is, they were very enthusiastic to recommend neurofeedback training if it would assist learners struggling with concentration problems. Just with this statement in mind, one could say that teachers are desperate for assistance and solutions to the problems they encounter daily with regard to concentration problems and that the problem is more far reaching than anticipated. Thus, this indicated a desperation among educators with regard to learners struggling with concentration problems in school. These results could have been influenced by the fact that the majority of educator respondents do not know anything about neurofeedback, but would still recommend it. The educator respondents were asked in an open-ended question to explain if they would recommend neurofeedback and to elaborate on why they would recommend that. They recommended neurofeedback, although they did not necessarily know what it was, because concentration problems are not always diagnosed or identified by teachers and neurofeedback would assist learners positively, as it could be detected by TESCA at an early age. They felt that knowledge is power, and the majority felt that anything that would benefit the child and help the teachers to assist learners to succeed and develop in positive ways, are welcomed. The educator respondents also mentioned that some learners would struggle with concentration problems, but not be noticed as the learners sit still and do not always indicate that they struggle as other learners do. They struggle to listen attentively and these learners perform exceptionally well academically, but the fast pace of school could have an effect on them later in their school going years, and the more help the parents and

children have, the better. They also felt that they need training in dealing with concentration problems, as it is more prevalent in class, and they felt it was because children do not move around, but are stagnant with too much screen time. The educator respondents also made it clear that they needed more information with regards to neurofeedback and that they would like to learn more as knowledge is power. They also indicated that they would endorse if it would help learners with concentration problems and parents to support and assist their children, as well as every teacher, who would attend training and use this system to help and assist struggling learners to perform better and reach their full potential. The majority of the educator respondents also felt that there are more unidentified children struggling with concentration problems.

According to the data gathered, the majority of teachers were qualified, with a bachelor degree, but what was worrying to see that 10% of the respondents were either a high school graduate or had vocational training. This could have an influence on preparing learners for school readiness, as well as teaching and learning as a whole. This is a general observation and those not trained could be assistants at these schools, although as teachers were asked to complete these questionnaires, it would be unfair to assume. This could also be a reason why some learners are not identified early on if they struggle with concentration problems, but further research should be done in this regard.

The educator respondents in this study were found to be mostly experienced with only a small percentage having 0 to 5 years' experience. These results are indicative that the educator respondents yield a vast amount of knowledge and experience within the teaching and learning field. This is also evident in the training these educator respondents receive, as seen by the data that the majority do attend training.

To attend training is important to keep up with any changes, but also to assist with mind-set and staying positive. Lifelong teaching and learning is a privilege as you are never too old to learn new ideas and trends. There are continuous changes in education and the education system therefore, it is important to attend training. Also of importance is to gain knowledge of changes and be a part of policy writing and being able to give input. The training they attend would either be workshops, seminars and short courses, as seen by the data analysed.

The data analysed and results found from the TESCA, neurofeedback training and focus group interviews, indicated that improvements were seen across the board. The learners that participated in the TESCA and neurofeedback training improved on almost all aspects, as seen by the results in this chapter. The teachers that took part in the focus group interviews also agreed with regard to the positive results and improvements noticed by them in the classroom where these learners attend. They stated that they would recommend Brain Gain Neurofeedback Training to all learners identified with concentration problems, as they saw and experienced the changes in the classroom with these learners. They could see results and improvements within these learners in terms of classroom behaviour, understanding work, completing tasks in the allocated time frames and as little human beings as a whole.

4.6 SUMMARY

This chapter presented data, analysis and findings in answering the objectives which was: to examine the influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness; to determine the experiences of teachers with Grade R learners' concentration levels; to determine the impact and influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness; to determine the perceptions of teachers regarding the implementation of Neurofeedback Training in schools; to determine if Neurofeedback Training can be implemented into the South African school curriculum and to determine the support teachers need, to assist with the implementation of Neurofeedback Training. The last two objectives are mainly addressed in Chapter 5 were the researcher gives recommendations and the final conclusions drawn, into the results found within this study.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This chapter completes the study by drawing conclusions from the data gained with regard to exploring the influence of neurofeedback training on Grade R learners' concentration levels for school readiness. This is done with the aim towards improving Grade R learners' concentration levels for school readiness, making some recommendations towards program changes or implementation opportunities, as well as suggestions for further study.

5.2 CONCLUSION

This research employed a mixed method approach by integrating both quantitative and qualitative data in a single project by an adopted and embedded convergent research design, whereby qualitative and quantitative research data are embedded in a larger design to achieve the objectives of this study. Close- and open-ended questionnaires were constructed and distributed to all participating schools in Bloemfontein, who were willing to take part in this research for the quantitative section of the study. A document analysis was also conducted with a registered occupational therapist, whereby four learners were chosen to take part in this research. Two learners only did the TESCA and the other two completed the full course Brain Gain Neurofeedback Training and the pre and post TESCA tests. The occupational therapist submitted a six-page report with the results of these test, which are from the computer programme used in this program. A focus group interview was held with four teachers with whom these children attend school at. The data were captured into an excel spreadsheet and a statistician used the Python computer programme to draw graphs for the representation of the data, while the six-page report was used by the researcher to compare results and the focus group interview to confirm results.

The findings and recommendations described below are centred on the results from the questionnaires, the focus group interview and the six-page report from the occupational therapist, conducting the Brain Gain Neurofeeback training and TESCA.

The main objectives of this study were to examine the influence of neurofeedback training on Grade R learners' concentration levels for school readiness. Other objectives that were also included in this study, were to determine the experiences of teachers with Grade R learners' concentration levels, to determine the impact and influence of neurofeedback training on Grade R learners' concentration levels for school readiness, as well as the perceptions of teachers regarding the implementation of neurofeedback training in school and if neurofeedback training can be implemented into the South African school curriculum. Another objective was to determine the support teachers need to assist with the implementation of neurofeedback training.

The first objective was to examine the influence of neurofeedback training on Grade R learners' concentration levels for school readiness in pre-primary and primary schools in Bloemfontein. According to the focus group interviews of the teachers teaching the learners that received the TESCA and Brain Gain Neurofeedback Training, as well as the evidence from the combined TESCA results, one could see significant improvements in the two learner respondents that did the full Brain Gain Neurofeedback Training. Both these learners improved almost in all of the five concentration indicators.

To address the second objective, which is to determine the experiences of teachers with Grade R learners' concentration levels, the majority of educator respondents stated that there are learners struggling with concentration problems and that many of these problems are not identified, due to the fact that they sit still and are not rowdy or trouble makers, rather day dreamers according to the educators, but still struggle with academic work and if further investigated, they struggle with concentration problems. The findings of this study reveal that educators indicate from the questionnaires, as well as the focus group interviews conducted, that they struggle with learners with

concentration trepidations on a daily basis, which is also supported by the literature review done, especially after the Covid-19 pandemic. Educators are facing huge challenges on a daily basis, perhaps more so after the Covid-19 pandemic and therefore need the support of parents and other role players in education to assist them in the proper functioning of the school system. The results from the surveys, as well as information gathered from the focus group interviews, agree that the involvement of parents, and all stakeholders, such as occupational therapists, speech therapists and remedial teachers, would definitely improve concentration.

The third objective of this research was to determine the impact and influence of neurofeedback training on Grade R learners' concentration levels for school readiness. The combined TESCA results are a clear indication that the Brain Gain Neurofeedback programme has a tremendous impact on learners' concentration levels and thus school readiness. When the brain is trained to concentrate, learners are able to sit still for longer periods at a time, thus assisting them from the transition from play in Grade R to being able to focus and grasping the instructions given by teachers and therefore being able to implement it correctly, as they are able to concentrate for longer periods at a time. Concentration is a critical skill, used on a daily basis from morning till evening, so as not to be late to school, to be able to work efficiently, to contribute to society as a whole and is a huge contributor to success in life. It is the ability to think carefully about something you are doing and nothing else, to focus your mind on one subject, object or thought and at the same time exclude any other unrelated thoughts, ideas, feelings and sensations, thus in essence, to be able to control your attention. The researcher therefore believes that the research has an important contribution to make towards improving learners' concentration levels through neurofeedback to improve school readiness; it would consequently be beneficial to the Department of Education, schools, educators, parents and learners. It also serves as a conduit for mutual cooperation and understanding between educators, learners and parents to create a possible solution for concentration problems for learners and therefore school readiness. New approaches to

concentration problems in schools ultimately enhance learner performance, teaching strategies, develop a sense of self-worth among learners and untimely lead to learners that perform and are not left behind. Educators in turn will be capable in executing their duties and achieve more desired outcomes from their learners, improving concentration problems in school more effectively. Concentration assists in studying, enables faster comprehension, improves the memory, helps in focusing on a task, job or goal, and enables you to ignore meaningless and irrelevant thoughts, thus giving the child a notion of mastery of his environment. These are just some of the values that may be gleaned from the research that could be applicable to the classroom milieu.

The perceptions of teachers regarding the implementation of neurofeedback training in school, were the fourth objective looked at. According to the results received from the surveys done, the educator respondents stated that they do not have much knowledge about neurofeeback or what it entails, but they felt that knowledge is power and that they would be welcoming any and everything that would help them and the parents to be able to identify and support the learners that struggle with concentration problems. Some of the responses recorded, stated that learners are thought to just struggle academically, but when looked into the situation, they found that these learners are struggling to concentrate and that they are not naughty as they struggle to sit still for certain periods of time that are required of them. They would initially have thought that these learners are naughty as they are rowdy, talkative, not sitting still and even bothering other learners in class, only to find upon further investigation that these learners struggle to concentrate. They also mentioned that there would be children, who are day dreamers whose concentration problems are missed, as they are quiet and not problematic as how learners with concentration problems “normally” behave. 53% of the educator respondents agreed that they would recommend that neurofeedback training be implemented in schools to assist with this fast growing problem, whereby 7% would not recommend neurofeedback training. However, this could be due to a lack of knowledge, as 9% stated that they do not have enough knowledge about

neurofeedback training to be able to choose if they would like to implement it or not and 1% were uncertain as they said yes and no for the implementation of neurofeedback training in schools. Although the teachers lack knowledge about neurofeedback training, the majority were enthusiastic to either receive training on it, as they believed knowledge is power, and as mentioned, they would embrace anything that would help learners in the classroom. The teachers in the focus group interview were excited about neurofeedback training, as they experienced the results in their classroom first hand. These teachers said that there are more learners in their respective classrooms, whom they would recommend to receive Brain Gain Neurofeedback training, as they saw the results in those learners who did the training and were part of this study project. They could see that the interaction of these learners were different, more interactive and that they could be given assignments or work to do and then they would fare much better working on their own. On the other hand, before the Brain Gain Neurofeedback Training, these learners would not be able to work on their own or they would be disturbing other learners to ask questions, as they did not understand or know what was expected of them as they missed the instructions, due to not focusing. These teachers sounded almost as if they were relieved with the possibilities they experienced first-hand, with the impact Brain Gain Neurofeedback had on the two learners who participated in this study. They could also pinpoint the vast difference between the ones receiving the full TESCA and Brain Gain Neurofeedback training, compared to those only indicating they have concentration problems, according to the TESCA pre-test, but who did not complete the recommended Brain Gain Neurofeedback training.

The fifth objective were to determine whether neurofeedback training can be implemented into the South African school curriculum. Unfortunately, Brain Gain Neurofeedback training can only be conducted by a qualified occupation therapist, but schools with special needs and those fortunate enough to have occupational therapists at their respective schools, could be assisted by the Department of Education to acquire the programme and receive the training as needed, by supporting them with funding.

This programme should definitely be looked at to be implemented into the school curriculum and be supported by qualified occupational therapist already at the Department of Education's disposal. As educators indicated, there are learners in schools being overlooked when it comes to identification of concentration problems, and this programme would be able to identify them if it is implemented when learners need the transition from Grade R to Grade 1. The expectations directed at learners, the pressure these poor children have to endure on a daily basis to perform and to be able to do things not necessarily on their development stage or age, are phenomenal. The Brain Gain Neurofeedback training system is where they coach/condition the brain to increase concentration levels when needed. This training increases, the blood flow to the brain, therefore increasing cognitive ability, therefore it is not a question if it can be implemented into the South African school curriculum, but rather a requirement, as it is needed for all learners in this rainbow nation, as children are the one's suffering most.

The last objective was to determine the support teachers need to assist with the implementation of neurofeedback training. Teachers would need the Department of Education to assist them with the appropriate knowledge to identify these learners struggling with neurofeedback training in the form of workshops, short courses or seminars, as it was seen from the questionnaire data that the educator respondents did attend training.

Educator respondents were also asked how they would recommend learners with concentration problems being assisted and they suggested that these learners should play while learning, do more concrete work that include movement, practical work, play concentration games and activities. These learners need resources that would stimulate their minds and challenges them to think, including physical apparatuses when teaching these learners, and learners should be tested early to identify barriers to learning and then be able to assist them early on with interventions. Some suggested that these learners need specific routines that would help them with their concentration problems. The majority suggested that these children, and even children in general, should be

physically more active and move their bodies and not be forced to start doing tasks at a young age. Teachers also indicated that parent involvement is important and that they should also assist learners at home to do tasks and homework. Educator respondents also indicated that one-on-one work with learners helped and assisted learners with concentration problems, but that it is a struggle if there are 30 to 35 learners in the classroom to be able to attend to each and every one needing one-on-one help.

5.3 RECOMMENDATIONS

In this subsection, the recommendations made by the researcher are listed, but suggestions from the educators and the focus group interviews, are also incorporated and considered.

- Suggestions from educators were that they should attend training to be informed about neurofeedback, what it entails and how it would assist and help them to be able to help learners struggling with concentration problems, as there are more and more learners identified each day struggling. Some learners are not always identified as struggling with concentration problems, as they do not fall in the “normal criteria” that are looked at when identifying them, namely of being naughty, noisy, not sitting still, loud, running around when they are supposed to sit still, etc. They stated that knowledge is power and they would be open to anything at this stage that would assist learners to succeed in their studies.
- Workshops should be therefore recommended to assist teachers to identify learners struggling with concentration problems. What the researcher recommends would be that a questionnaire or some list similar to DSM 5 being used by medical doctors, paediatricians and other therapists should be development for educators to be able to identify these learners and to refer them for further assistance at a registered occupational therapist with the Brain Gain Neurofeedback training to assist learners struggling with concentration problems.
- Teamwork by all stakeholders involved in education, namely parents, teachers, various therapists, remedial teachers, Department of Education, etc. is necessary

to manage concentration problems by assisting each other and supporting one another in identifying these learns to assist them with the transition from Grade R to Grade 1. By identifying concentration problems at an early stage could assist children to be able to holistically treat it with the assistance with various therapists by also implementing Brain Gain Neurofeedback training, whereby the brain is coached/conditioned to increase concentration levels when needed, before medication is even necessary.

- A school committee could be established by each school or region to meet and discuss aspects of concentration and how to effectively support each other and assist with learners struggling, especially after the Covid-19 pandemic and seeing that there is evidence of a backlog or rather that children are behind with a year in teaching and learning, due to the pandemic. This would also be helpful to implement Brain Gain Neurofeedback into the school curriculum or system. These committees could also implement or design policies to assist with the process and thus will need support from the Department of Education.
- School management could also be involved in designing support programmes, focusing on parent guidance to support their children and how to become involved, as it was indicated that learners did improve their concentration levels where parents were seeming to be involved. Parental involvement is important, especially in their foundation phase of learning. Lebopa (2010) stated that parental involvement is a key factor in securing higher student achievement and sustained school performance.
- The National School Nutrition Programme, whose aim is to foster better quality education implemented in schools and which is funded by the Department of Education, would be a good start to use the policy to be able to implement and financially support schools, families, teachers and learners to be able to form part of the Brain Gain Neurofeedback programme conducted by a qualified and registered occupational therapist, as it would not be possible to appoint an occupational therapist at each school throughout South Africa. The researcher

however, suggests that the established centres should be approached and a memorandum of understanding or a partnership could be established to support these schools, teachers, parents and most importantly children struggling with concentration problems and more specifically from Grade R to Grade 1, in support of their school readiness, in their respective cities/towns.

- The transition from Grade R where children are still relatively in an informal setting of teaching and learning and play, are more important for them than performing tasks and then transitioning from play to a formal setting in Grade 1, where they are expected to sit still for long periods at a time. Brain Gain Neurofeedback training would be the solution as more serious concentration problems would be identified and could be dealt with at a younger age and turned around before they reach higher levels of teaching and learning, and thus success and achievement would be satisfying. Thus, Brain Gain Neurofeedback training would be the answer to the transition as well, because it works on the principle whereby the blood flow is increased to the brain and thus increases their cognitive ability. It assists in coaching the brain to increase concentration levels when needed.
- University/Central University of Technology training programmes for educators should also be revised and all their programmes (early childhood development and foundation phase education) should contain an inclusive education section whereby child development is addressed. Also conditions should be identified, such as concentration problems and methods of identifying it by using a questionnaire or list as mentioned above containing DSM 5 questions to assist teachers for the identification of these learners and methods to help learners with it like Brain Gain Neurofeedback Training and not just the conventional sitting in front of the class, remedial, various therapies or adaptations. The Department of Basic Education and Higher Education should be involved in this process.
- Training institutions should add, from the first year of education training, practical class experience/workplace experience, where these new teachers could

experience various disabilities and problems first-hand, encountered in the classroom and how it is handled. This would also improve education and they could assist struggling learners to be included and holistically developed.

- The empirical survey, the TESCA test and Brain Gain Neurofeedback Training system, as well as the focus group interview in this study, were limited to one city in the Free State Province, namely Bloemfontein. Further research should be done that includes more respondents from other provinces to provide a more generalised and comprehensive overview.
- Hosting or develop programmes in schools to involved parents in their children's education and teach them behavioural plans to assist with struggling learners.

5.4 STUDY CONTRIBUTION

Although this area of research is not widely research, I believe the contribution this study would mount to would be immeasurable. There is a desperate need among teachers as the majority in this study did not know anything about neurofeedback or have heard some information, but everyone is open to learn more and would use it if it would assist learners struggling with concentration problems. This research would not just be contributing to assist teachers with the fast concentration problem that exists in schools but more so after the Covid 19 pandemic. It would also contribute towards learners to improve their life and development in general to be able to reach their full potential as they are set to do. This study would also have a positive impact on parents struggling at home to reprimand learners struggling with concentration problems to assist them as these learners will be able to listen with attention and able to comply. Learners, parents and teachers are not the only beneficiaries with regard to this research study, but also the Basic Education system as a whole. When the Basic Education system implement this concept of Brain Gain Neurofeedback from the foundation phase especially in previously disadvantaged schools and areas were poverty is still prevalent, it would have a positive impact on those learners. These learners already have disadvantages but could be assisted to reach their full potential

and in essence have an impact on the South African economy one day, as they are our future leaders. The contributions this study could pertain are therefore endless and have the potential to grow from strength to strength as Brain Gain Neurofeedback can also be use with success not just on foundation phase learners but all learners in the education system as well as in sports to enhance concentration and focus.

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APPENDIX

APPENDIX A – INFORMATION LEAFLET AND CONCENT FORM TEACHERS

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS UV

RESEARCH STUDY INFORMATION LEAFLET AND CONSENT FORM

DATE

30 September 2021

TITLE OF THE RESEARCH PROJECT

Exploring the influence of neurofeedback training on Grade R learners' concentration levels for school readiness, as my topic

PRINCIPLE INVESTIGATOR / RESEARCHER(S) NAME(S) AND CONTACT NUMBER(S):

Lerina Bosch *2006001115* *082 788 5642*

FACULTY AND DEPARTMENT:

Faculty of Education

Psychology of Education

STUDY LEADER(S) NAME AND CONTACT NUMBER:

Prof. Christa Beyers

051 4013456 / 27832575823

Dr. Kananga Robert Mukuna

058 7185343 / 27810451473

205 Nelson Mandela Drive/Rylaan, Park West/Parkwes, Bloemfontein 9301, South Africa/Suid-Afrika
P.O. Box/Posbus 339, Bloemfontein 9300, South Africa/Suid-Afrika, T: +27(0)51 401 9111, www.ufs.ac.za

WHAT IS THE AIM / PURPOSE OF THE STUDY?

Atmore, van Niekerk and Ashley-Cooper (2012) states, education is a basic human right and fundamental in building life-long learning and economic opportunities. They indicated that although South Africa has made progress since 1994, in early childhood development and Grade R provisioning, there are still significant challenges. These challenges include proper infrastructure, nutrition, early childhood teachers among others, but more so developmental challenges children face daily. According to Lehohla (2017), the South African education system consists of three phases: primary, secondary, and post-secondary. Children spend one to two years in early childhood development centres, and one year in Grade RR, which is still part of the early childhood development centre and fall under the Department of Social Developments umbrella. Grade R (kindergarten) has formed part of the Foundation phase (Grade R to Grade 3) education policy since 1998 and are attended at Primary schools. By law, children have to start attending school the year before the calendar year in which they turn seven (age of compulsory schooling). They should therefore reach Grade 1 by age seven, and spend eight years in primary school, which ends in Grade 7 .Janse van Rensburg (2015) stated clearly that, according to the current National Curriculum and Assessment Policy Statement (CAPS), there are certain assessment standards that should be achieved by the end of the Grade R year. This include that a Grade 1 learner should be able to be physically, cognitively, affectively, normatively, socioculturally and linguistically ready for a solid start to his or her school career. Research revealed that high screen-time is associated with deleterious effects on irritability, low mood and cognitive and socio-emotional development, leading to poor educational performance, hence affecting concentration levels (Stiglic & Viner, 2019; Lee, 2018). Lee (2018) further indicated that some common signs of stress and anxiety include: behavioural or emotional signs which include difficulty concentrating as well as various other signs which are not mentioned as it is not relevant to this research. These researchers confirmed some of the effects related to how kids develop during the technological era, and affecting their behavioural and emotional well-being and then in essence school readiness, which in turn is my experience with Grade R learners' concentration levels for school readiness (Stiglic & Viner, 2019; Lee 2018). I would like to conduct a comprehensive study to determine if Brain Gain Neurofeedback Training Influences Grade R learners' concentration levels for school readiness. I would like to seek solutions to the problems parents, teachers and children alike struggle with, especially children who are born later in the year and are behind on various developmental milestones due to age. If positive results yield, Brain Gain Neurofeedback could assist all Grade R learners' concentration levels improve and be vitally important to Grade R learners' transitioning from Grade R to Grade 1. The aim of Brain Gain Neurofeedback Training is to assist a child to enter Grade 1 with confidence and to develop them naturally and holistically to achieve just that without medication. To examine the influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness. With this background in mind the researcher would like to determine the impact and influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness, to determine the experiences of teachers with Grade R learners' concentration levels?, to determine the perceptions of teachers regarding the implementation of Neurofeedback Training in schools, to determine if Neurofeedback Training can be implemented into the South African School curriculum and to determine the support teachers need to assist with the implementation of Neurofeedback Training.

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WHO IS DOING THE RESEARCH?

My name is Lerina Bosch; I am a qualified Lecturer at Motheo TVET College. The reasons for doing this research is not just because of my passion in special needs and inclusive education, but lay closer to my heart and being personal. My eldest son is born later in the year and struggle with concentration issues, from there the interest into concentration and the transition from Grade RR to Grade 1. The study developed from there to: Exploring the influence of neurofeedback training on Grade R learners' concentration levels for school readiness.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This study has received approval from the Research Ethics Committee of UFS. A copy of the approval letter can be obtained from the researcher.

Approval number: *UFS-HSD2021/1663/22*

WHY ARE YOU INVITED TO TAKE PART IN THIS RESEARCH PROJECT?

You are invited to take part in this research as you are a teacher at a primary school in Bloemfontein. I know the questionnaire you will complete, will give me the data I need to assist teachers, parents, Early Childhood Development and Department of Education as a whole to comprehend the difficulties and daily struggles you encounter to assist school readiness and in essence to attend 'big school' without any problems, as it is a huge step from Grade RR to Grade 1.

WHAT IS THE NATURE OF PARTICIPATION IN THIS STUDY?

The nature of your participation is as follows: You will complete a questionnaire to the best of your ability. The data gathered will assist us to determine the problems and better understand concentration problems encountered in the classroom, to better assist teachers with solutions to this problem.

205 Nelson Mandela Drive/Rylaan, Park West/Parkwes, Bloemfontein 9301, South Africa/Suid-Afrika
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CAN THE PARTICIPANT WITHDRAW FROM THE STUDY?

Your participation is voluntary and that there is no penalty or loss of benefit for non-participation. Being in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving a reason. Although your participation will be appreciated as information collected will be treated as totally confidential and your details will not be made public.

WHAT ARE THE POTENTIAL BENEFITS OF TAKING PART IN THIS STUDY?

The value of this research study would be of utmost importance to the Department of Education, teachers, parents and children alike, as it would assist the early childhood development sector to assist Grade R learners with concentration levels, in order to prepare them for primary school. In my opinion there seems to be a huge gap between Grade R and Grade 1. The majority of Grade R schooling consists of play and is more informal as compared to sitting in a formal class setting in Grade 1. The Department of Education have a responsibility towards all children to ensure inclusivity in schools. In this case it is important that inclusivity become a central part of the organizational planning and teaching at each school. This objective would only be possible if all teachers have a sound understanding of how to recognize and address barriers to learning, and how to plan for diversity. South Africa is a diverse country with diverse cultures and everyone should be included. This can only be achieved with knowledge, as knowledge is power. This research would be the vehicle to the knowledge needed to assist children with the transition from informal schooling to formal schooling. It would also assist all stakeholders in the teaching and learning sector to address issues that teachers would be able to voice in this research, with possible solutions.

There are also various possible causes of concentration level deterioration in children today, more so than before, as well as the prevalence thereof. This research would be able to identify and confirm concentration level issues, through the literature review and the research itself. This research would therefore be beneficial to assist all stakeholders in teaching and learning on various levels of the future leaders of South Africa.

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WHAT IS THE ANTICIPATED INCONVENIENCE OF TAKING PART IN THIS STUDY?

Minor level of inconvenience can be expected as the researcher only require the teacher to complete a questionnaire. Time to complete questionnaire.

WILL WHAT I SAY BE KEPT CONFIDENTIAL?

The information of the participant as well as the data gathered will all be treated as confidential. give. Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records. Data gathered anonymously may be used for other purposes, e.g. research reports, journal articles conference presentation, etc. But your privacy will be protected throughout the duration of the study and any processes or publications afterwards. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. Every effort will be made by the researcher to ensure that you will not be connected to the information that is gathered during this research.

HOW WILL THE INFORMATION BE STORED AND ULTIMATELY DESTROYED?

Hard copies of the questionnaire and data interpret will be stored by the researcher for a period of five years in a locked cupboard in my home office for future research or academic purposes; electronic information will be stored on a password protected computer. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. Information will be destroyed after 5 years by means of shredding and no inconvenience or discomfort will be caused to the participant.

WILL I RECEIVE PAYMENT OR ANY INCENTIVES FOR PARTICPATING IN THIS STUDY?

No payment or any incentives will be given for your participation, but data gathered from your participation will assist parents, teachers, Early Childhood Development, Department of Education and children struggle with concentration problems in the future.

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HOW WILL THE PARTICIPANT BE INFORMED OF THE FINDINGS / RESULTS OF THE STUDY?

If you would like to be informed of the final research findings, please contact Lerina Bosch on 0827885642 or lerinabosch@gmail.com. The findings are accessible for 5 years. Should you require any further information or want to contact the researcher about any aspect of this study, please contact Prof. Christa Beyers 051 4013456 / 27832575823 / Dr. Kananga Robert Mukuna 058 7185343 / 2781045147. Should you have concerns about the way in which the research has been conducted, you may contact Prof. Christa Beyers 051 4013456 / 27832575823 / Dr. Kananga Robert Mukuna 058 7185343 / 2781045147.

Thank you for taking the time to read this information sheet and for participating in this study!

CONSENT TO PARTICIPATE IN THIS STUDY

I, the undersigned,

_____ (*participant's full names to be included*), (the "**Participant**")

confirm that I voluntarily agree to participate in the research study referred to as the

_____ (the **"Study**") in relation to

_____

_____

and which Study is being conducted by

_____

(*insert the name of the researcher*), (the "**Researcher**").

I, the undersigned Participant, further confirm that–

1. the Researcher has explained the nature, procedure, potential benefits and anticipated inconvenience of my participation in the Study;
2. I have read (or had explained to me) and understood the Study as explained in the attached information sheet;
3. I have had sufficient opportunity to ask questions and am prepared to participate in the Study;
4. I understand that my participation in the Study is entirely voluntary and that I am free to withdraw at any time without penalty (if applicable);
5. I voluntarily provide the UFS and the Researcher with my personal information and consent to the UFS and the Researcher collecting, disclosing and processing my personal information in order to conduct the Study and any related activities in relation thereto;

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6. I hereby acknowledge and confirm that I understand the purpose for which the UFS and the Researcher may collect, store, use, delete, destroy, outsource, transfer or otherwise process, as the context and circumstances may require and as contemplated in terms of POPIA, my personal information as set out herein;
7. I am aware that the findings of the Study will be anonymously processed into a research report, journal publications and/or conference proceedings and that my personal information will be aggregated and de-identified at such stage;
8. I also give the UFS permission to share, without notification, the collected data with other researchers at the UFS or other Higher Education Institutions. This permission is dependent on the same principles of ethical research practices, anonymity/confidentiality, safekeeping of information, and other issues listed above applying.

I, the Participant, agree to the recording of the *questionnaire*.

Full Name of Participant: _____

Signature of Participant: _____ Date: _____

Full Name(s) of Researcher(s): _____

Signature of Researcher: _____Date: _____

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APPENDIX B – INFORMATION LEAFLET AND PARENTAL CONCENT FORM

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RESEARCH STUDY INFORMATION LEAFLET AND PARENTAL CONSENT FORM

DATE

30 September 2021

TITLE OF THE RESEARCH PROJECT

Exploring the influence of neurofeedback training on Grade R learners' concentration levels for school readiness, as my topic

RESEARCHERS NAME(S) AND CONTACT NUMBER:

Lerina Bosch 2006001115 082 788 5642

FACULTY AND DEPARTMENT:

Faculty of Education

Psychology of Education

STUDYLEADER(S) NAME AND CONTACT NUMBER:

Prof. Christa Beyers

051 4013456 / 27832575823

Dr. Kananga Robert Mukuna

058 7185343 / 27810451473

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WHAT IS THE AIM / PURPOSE OF THE STUDY?

Atmore, van Niekerk and Ashley-Cooper (2012) states, education is a basic human right and fundamental in building life-long learning and economic opportunities. They indicated that although South Africa has made progress since 1994, in early childhood development and Grade R provisioning, there are still significant challenges. These challenges include proper infrastructure, nutrition, early childhood teachers among others, but more so developmental challenges children face daily. According to Lehohla (2017), the South African education system consists of three phases: primary, secondary, and post-secondary. Children spend one to two years in early childhood development centres, and one year in Grade RR, which is still part of the early childhood development centre and fall under the Department of Social Developments umbrella. Grade R (kindergarten) has formed part of the Foundation phase (Grade R to Grade 3) education policy since 1998 and are attended at Primary schools. By law, children have to start attending school the year before the calendar year in which they turn seven (age of compulsory schooling). They should therefore reach Grade 1 by age seven, and spend eight years in primary school, which ends in Grade 7 .Janse van Rensburg (2015) stated clearly that, according to the current National Curriculum and Assessment Policy Statement (CAPS), there are certain assessment standards that should be achieved by the end of the Grade R year. This include that a Grade 1 learner should be able to be physically, cognitively, affectively, normatively, socioculturally and linguistically ready for a solid start to his or her school career. Research revealed that high screen-time is associated with deleterious effects on irritability, low mood and cognitive and socio-emotional development, leading to poor educational performance, hence affecting concentration levels (Stiglic & Viner, 2019; Lee, 2018). Lee (2018) further indicated that some common signs of stress and anxiety include: behavioural or emotional signs which include difficulty concentrating as well as various other signs which are not mentioned as it is not relevant to this research. These researchers confirmed some of the effects related to how kids develop during the technological era, and affecting their behavioural and emotional well-being and then in essence school readiness, which in turn is my experience with Grade R learners' concentration levels for school readiness (Stiglic & Viner, 2019; Lee 2018). I would like to conduct a comprehensive study to determine if Brain Gain Neurofeedback Training Influences Grade R learners' concentration levels for school readiness. I would like to seek solutions to the problems parents, teachers and children alike struggle with, especially children who are born later in the year and are behind on various developmental milestones due to age. If positive results yield, Brain Gain Neurofeedback could assist all Grade R learners' concentration levels improve and be vitally important to Grade R learners' transitioning from Grade R

to Grade 1. The aim of Brain Gain Neurofeedback Training is to assist a child to enter Grade 1 with confidence and to develop them naturally and holistically to achieve just that without medication. To examine the influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness. With this background in mind the researcher would like to determine the impact and influence of Neurofeedback Training on Grade R learners' concentration levels for school readiness, to determine the experiences of teachers with Grade R learners' concentration levels?, to determine the perceptions of teachers regarding the implementation of Neurofeedback Training in schools, to determine if Neurofeedback Training can be implemented into the South African School curriculum and to determine the support teachers need to assist with the implementation of Neurofeedback Training

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WHY HAVE YOUR CHILD BEEN INVITED TO TAKE PART IN THIS RESEARCH PROJECT?

You are invited to take part in this research as you are a learner in a primary school in Bloemfontein. I know the school readiness test (TESCA) and the Brain Gain Neurofeedback Training you will receive will give me the data I need to assist teachers, parents, Early Childhood Development and Department of Education as a whole to comprehend the difficulties and daily struggles you encounter to assist school readiness and in essence to attend 'big school' without any problems, as it is a huge step from Grade RR to Grade 1.

WHO IS DOING THE RESEARCH

My name is Lerina Bosch; I am a qualified Lecturer at Motheo TVET College. The reasons for doing this research is not just because of my passion in special needs and inclusive education, but lay closer to my heart and being personal. My eldest son is born later in the year and struggle with concentration issues, from there the interest into concentration and the transition from Grade RR to Grade 1. The study developed from there to: Exploring the influence of neurofeedback training on Grade R learners' concentration levels for school readiness.

HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This study has received approval from the Research Ethics Committee of UFS. A copy of the approval letter can be obtained from the researcher.

Approval number: *UFS-HSD2021/1663/22*

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WHAT WILL HAPPEN TO YOUR CHILD IN THIS STUDY?

The nature of your participation is as follows: You will undergo a school readiness test (TESCA) and Brain Gain Neurofeedback training. It is not invasive and it will be done in conjunction with a qualified occupational therapist. The TESCA takes about an hour and the results will be made available to the parents if they want the information, BUT please take note all information for this study will be done anonymous and confidential. The researcher only wishes to compare data. The Brain Gain Neurofeedback training is a system whereby the child will watch a movie (e.g. cars/planes) with a headset on linked to a laptop and the computer program is used to train and teach (self-regulate), learn to concentrate for longer periods. The program starts off with 5 minutes and will increase over time. This will take about 6 months in total. Two children will receive only the TESCA.

CAN ANYTHING BAD HAPPEN TO YOUR CHILD?

Minor level of inconvenience can be expected as the researcher only require the learner to attend TESCA once in the beginning of the program and the end and the Brain Gain Neurofeedback training once a week. A headset will be placed on the child's head and he/she will watch an animated movie for instance Planes, Cares or Cinderella etc. Potential risk not anticipated.

CAN ANYTHING GOOD HAPPEN TO YOUR CHILD?

Benefits might involve self-regulation in terms of training the brain to improve concentration levels, know the level of school readiness and possible needs that might arise and be address in ample time to assist the learner for school readiness on time.

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WILL ANYONE KNOW YOUR CHILD IS PART OF THE STUDY?

The information of the participant as well as the data gathered will all be treated as confidential. give. Your answers may be reviewed by people responsible for making sure that research is done properly, including the transcriber, external coder, and members of the Research Ethics Committee. Otherwise, records that identify you will be available only to people working on the study, unless you give permission for other people to see the records. Data gathered anonymously may be used for other purposes, e.g. research reports, journal articles conference presentation, etc. But your privacy will be protected throughout the duration of the study and any processes or publications afterwards. A report of the study may be submitted for publication, but individual participants will not be identifiable in such a report. Every effort will be made by the researcher to ensure that you will not be connected to the information that is gathered during this research.

WHO CAN YOU TALK TO ABOUT THE STUDY?

If you would like to be informed of the final research findings, please contact Lerina Bosch on 0827885642 or lerinabosch@gmail.com. The findings are accessible for 5 years. Should you require any further information or want to contact the researcher about any aspect of this study, please contact Prof. Christa Beyers 051 4013456 / 27832575823 / Dr. Kananga Robert Mukuna 058 7185343 / 2781045147. Should you have concerns about the way in which the research has been conducted, you may contact Prof. Christa Beyers 051 4013456 / 27832575823 /.

WHAT IF YOU DO NOT WANT YOUR CHILD TO DO THIS?

Your participation is voluntary and that there is no penalty or loss of benefit for non-participation. Being in this study is voluntary and you are under no obligation to consent to participation. If you do decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form.

You are free to withdraw at any time and without giving a reason. Although your participation will be appreciated as information collected will be treated as totally confidential and your details will not be made public.

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PLEASE RETURN

Name of child: _____

Name of Parent: _____

- Do you understand this research study and are you willing? to let your child, take part in it? Yes ☐ No ☐
- Has the researcher answered all your questions? Yes ☐ No ☐
- Do you understand that you can withdraw from the study at any time? Yes ☐ No ☐
- I give the researcher permission to make use of the data gathered from my child's participation Yes ☐ No ☐

_____ _____

Signature of Parent ***Date***

I, the undersigned Parent, further confirm that–

1. the Researcher has explained the nature, procedure, potential benefits and anticipated inconvenience of my participation in the Study;
2. I have read (or had explained to me) and understood the Study as explained in the attached information sheet;
3. I have had sufficient opportunity to ask questions and am prepared to participate in the Study;
4. I understand that my participation in the Study is entirely voluntary and that I am free to withdraw at any time without penalty (if applicable);

5. I voluntarily provide the UFS and the Researcher with my personal information and consent to the UFS and the Researcher collecting, disclosing and processing my personal information in order to conduct the Study and any related activities in relation thereto;

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6. I hereby acknowledge and confirm that I understand the purpose for which the UFS and the Researcher may collect, store, use, delete, destroy, outsource, transfer or otherwise process, as the context and circumstances may require and as contemplated in terms of POPIA, my personal information as set out herein;
7. I am aware that the findings of the Study will be anonymously processed into a research report, journal publications and/or conference proceedings and that my personal information will be aggregated and DE identified at such stage;
8. I also give the UFS permission to share, without notification, the collected data with other researchers at the UFS or other Higher Education Institutions. This permission is dependent on the same principles of ethical research practices, anonymity/confidentiality, safekeeping of information, and other issues listed above applying.

I, the Parent, agree to the recording of the insert specific data collection method.

Full Name of Participant: _____

Signature of Participant: _____ Date: _____

Full Name(s) of Researcher(s): _____

Signature of Researcher: _____Date: _____

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APPENDIX C – COVER LETTER

20 Veen Crescent
Universitas
Bloemfontein
9321

Cell no: 082 788 5642
30 September 2021

Attention: Educators and Learners

School readiness refer to a whether a child is ready to make an easy and successful transition into school. This is important to allow teachers to further develop a child's skills in the specific areas of social interactions, play, language, emotional development, physical skills, literacy and fine motor skills. Without these basic skills established it could happen that children play 'catch up' compared to peers. As an educator who experiences disciplinary issues within the classroom herself, I became interested in researching this topic for my PhD degree at the University of the Free State.

Your contribution to the abovementioned research would be of great assistance. I kindly request that you devote a few minutes of your time to complete the attached questionnaire. The collection date for questionnaires is 24th November 2021. The questionnaire is strictly confidential and the information you provide will be used for research purposes only.

It is hoped that your response to this endeavour will enrich the knowledge base of the Department of Education, Policy writers and the public with regard to discipline issues in schools. The more responses I receive, the more accurate the data, which will result in a better survey, ultimately contributing to the challenges of new concepts of discipline which are consistent with the new democracy in South Africa.

Should you be interested in the results of the research, feel free to contact me at the above Cell phone number. I will gladly furnish you with a summary of results.

Sincerely,

…….
L.C. Bosch

APPENDIX D – EDUCATOR QUESTIONNAIRE

EDUCATOR QUESTIONNAIRE

(CONFIDENTIAL)

CONCENTRATION LEVELS OF GRADE R LEARNERS FOR SCHOOL READINESS

INSTRUCTIONS:

Please return ALL completed and blank questionnaires.

Please use a black /blue pen and mark an "X" on the empty block, which corresponds with the answer of your choice.

Thank you!

A. DEMOGRAPHIC DATA.

1. What is your age?

☐ 20-24 years old

☐ 25- 34 years old

☐ 35-44 years old

☐ 45-54 years old

☐ 55-65 years old

2. **What is your gender?**

☐ Male ☐ Female

3. **What is your home language?**

☐ Sesotho

☐ Xhosa

☐ Se Tswana

☐ Others, please specify [ ]

B. CLASS COMPOSITION

4. **Which grade do you teach?**

☐ Grade RR

☐ Grade R

☐ Grade 1

☐ Other, please specify [ ]

5. **Is it a multi grade class?**

☐ Yes ☐ No

6. **How many children are in the class?**

7. **Are there children with disabilities in your class?**

☐ Yes ☐ No

If yes, what type of disabilities? Please specify:

_____

_____

_____

8. **How do you identify children in your class with concentration problems?**

☐ From my observations/Interactions with child

☐ From information provided from their parents

☐ From information provided from health care providers visits

☐ I don't identify them

☐ Others, please specify [ ]

9. **What do you usually do when you see a child with concentration problems in you class?**

☐ Nothing/nothing I can do

☐ Ask child to study harder and try to focus and concentrate on work

☐ Call parents and talk to them to assist

☐ Send child for remedial

☐ Ask assessment from occupational therapist

☐ Ask assessment from speech therapist

☐ Move child to front of the class

☐ Others, please specify [ ]

10. **What type of extra support do children with concentration problems receive in you school?**

☐ No extra support

☐ Additional individual support from teacher

☐ Remedial support (additional individual support from someone other than the teacher in school (e.g. special educator)

☐ Remedial support out of school time

☐ Physical adaptations in school

☐ Provision of specialized equipment

☐ Don't know

☐ Other, please specify [ ]

11. Do you notice significant improvement after learners received support from the school?

☐ Yes ☐ No

12. Elaborate on the improvements noticed:

_____

_____

_____

13. Do you have heard about neurofeedback training?

☐ Yes ☐ No

14. Elaborate on your knowledge of neurofeedback training?

_____

15. Would you recommend a neurofeedback training programme to be implemented into the school system to assist with concentration problems?

☐ Yes ☐ No

16. Do you think there is more children struggle with concentration problems?

☐ Yes ☐ No

If your answer is yes, why do you say that:

_____

_____

_____

17. What do you recommend should change or be done to assist Grade R learners' concentration levels for school readiness to improve?

_____

_____

_____

C. PROFESIONAL QUALIFICATION & DEVELOPMENT

18. What is your highest degree or level of education?

☐ No schooling completed

☐ High School Graduate

☐ Vocational Training

☐ Associate Degree

☐ Bachelor's Degree

☐ Master's Degree

☐ Doctoral Degree

19. Years of teaching experience?

☐ 0-5 years

☐ 6-15 years

☐ 16 -25 years

☐ 26-35 years

☐ 36-45 years

☐ Others, please specify [ ]

20. Do you go regularly for up skilling / training?

☐ Yes ☐ No

21. What type of training do you attend?

☐ Workshops

☐ Seminars

☐ Short courses

☐ No training at all

☐ Others, please specify [ ]

Thank you!

APPENDIX E – FOCUS GROUP INTERVIEW QUESTIONS

EDUCATOR INTERVIEW

(CONFIDENTIAL)

CONCENTRATION LEVELS OF GRADE R LEARNERS FOR SCHOOL READINESS

1. How do you assist learners to make a successful transition from Grade R to Grade 1?
2. What specially trained personnel are available at your school to assist learners and teachers (counsellors, therapists, psychologist, etc.)?
3. Do you think more learners struggle with concentration problems that is identified?
4. Do you think concentration problems need to be addressed rather sooner than later; is it therefore a bigger problem than what people might think and more prevalent?

5. To what extent do staff members work collaboratively to solve problems and respond to the needs of learners?
6. Have you heard about neurofeedback? Elaborate
7. Can you give me background information of the learner/s in question?
8. Does the learner/s in question have a concentration problem in the classroom?
9. Did you see significant improvement with this learner after receiving Brain Gain Neurofeedback Training? Elaborate
10. Would you recommend neurofeedback training programme to be implemented into the school system to assist learners with concentration problems? Motivate your answer.