Foundation phase teachers' views on the role of proprioceptive development in school readiness

by

Maria Elizabeth Labuschagne

Submitted in partial fulfilment of the requirements for the degree

MAGISTER EDUCATIONIS

(Educational Psychology)

Department of Educational Psychology

Faculty of Education

University of Pretoria

SUPERVISOR

Prof. Suzanne Bester

PRETORIA

November 2022

ACKNOWLEDGEMENTS

"We're all just walking each other home." - Ram Das

I would like to express my sincere gratitude and appreciation to the following individuals:

- Jaco, my husband and best friend. Thank you for your loving support and knowing just how to get me through the tough days.

- My parents, Anita and Marius Dippenaar, for believing in me and encouraging me to be the best version of myself.

- My extended family, aunts and cousins for your understanding that laughter can fix anything.

- My supervisor, Prof Suzanne Bester, for your guidance, personal attention, suggestions and support.

- My language editor, Nikki Watkins, thank you for your keen assistance and patience with all my technical requests.

- RWFL-Centurion; you were more than just cheerleaders. Every hug, every encouraging message and every kilometre contributed to the completion of this study.

- Bosberaad, Linda and Hester; I'm out of day 2!

- My friends, Kayleigh and Anneke; your voice notes always arrived at exactly the right time.

- Duncan and Tessa, I could not have asked for better study buddies.

- Daniëlle, may my journey inspire you to own your story and move mountains.

- The next generation: Christiaan, Daniëlle, Juan, Dian, Juvan, Mikay, Milla, Janco, Daniel, Divan, Kian, Ben, and Sandy, I dedicate this study to you.

- Jesus, may they know me by my love.

DECLARATION

I, Maria Elizabeth Labuschagne (student number 22182022), declare that the dissertation, which I hereby submit for the degree Magister Educationis in Educational Psychology at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or any other tertiary institution.

....

Maria Elizabeth Labuschagne

November 2022

ETHICS CLEARANCE CERTIFICATE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Faculty of Education

RESEARCH ETHICS COMMITTEE

CLEARANCE CERTIFICATE	CLEARANCE NUMBER: **EDU127/20**
DEGREE AND PROJECT	MEd
	Foundation phase teachers' views on the role of proprioceptive development in school readiness
INVESTIGATOR	Mrs Maria Elizabeth Labuschagne
DEPARTMENT	Educational Psychology
APPROVAL TO COMMENCE STUDY	29 October 2020
DATE OF CLEARANCE CERTIFICATE	14 November 2022

CHAIRPERSON OF ETHICS COMMITTEE: Prof Funke Omidire

CC

Mr Simon Jiane
Prof Suzanne Bester

This Ethics Clearance Certificate should be read in conjunction with the Integrated Declaration Form (D08) which specifies details regarding:
- Compliance with approved research protocol,
- No significant changes,
- Informed consent/assent,
- Adverse experience or undue risk,
- Registered title, and
- Data storage requirements.

ETHICS STATEMENT

The author, whose name appears on the title page of this dissertation, has obtained, for the research described in this work, the applicable research ethics approval. The author declares that she has observed the ethical standards required in terms of the University of Pretoria's Code of Ethics for researchers and the policy guidelines for responsible research.

....

Maria Elizabeth Labuschagne

November 2022

DECLARATION – LANGUAGE EDITOR

Nikki Watkins

Editing/proofreading services

Cell: 072 060 2354   E-mail: nikki.watkins.pe@gmail.com

13 November 2022

To whom it may concern

This letter serves to inform you that I have done language editing and proofreading on the thesis

Foundation Phase teachers' views on the role of proprioceptive development in school readiness

by

Maria Elizabeth Labuschagne

Professional
EDITORS
Guild

Nikki Watkins
Associate Member

Membership number: WAT003
Membership year: March 2022 to February 2023

072 060 2354
nikki.watkins.pe@gmail.com

www.editors.org.za

SA Writers College Certificate of Copy-Editing and Proofreading

All changes were indicated by Track Changes (MS Word) for the author to verify. As the editor I am not responsible for any changes not implemented, any plagiarism or unverified facts. The final document remains the responsibility of the author.

ABSTRACT

Foundation phase teachers' views on the role of proprioceptive development in school readiness

by

Maria Elizabeth Labuschagne

Supervisor: Prof. Suzanne Bester

Degree: M. Ed. (Educational Psychology)

This exploratory case study reports on the views of six purposively selected Foundation Phase teachers from an independent school in Gauteng on the role of proprioceptive development in school readiness. The study was guided by Ayres' sensory integration theory, which is based on the assumptions that the brain can change and that this change leads to the sequential development of sensory integration capacities; that there is an interactive relationship between brain organisation and adaptive behaviour; that sensory information integrates effectively when the cortical areas of the brain interact with the sub-cortical areas; and that internal motivation drives participation in sensory-motor activities, thus fostering sensory information integration.

Guided by an interpretivist paradigm, this qualitative case study found that the participants have extensive knowledge of school readiness, and the skills children need to demonstrate that they are ready for formal academic learning. In contrast with this, they were less confident about their knowledge of proprioception and the role it plays in school readiness. However, the participants were able to relate proprioceptive development to specific physical, emotional and cognitive school readiness skills and

challenges with concentration and they were able to identify movement activities that may be conducive to proprioceptive development. The COVID-19 pandemic and resulting social distancing and the wearing of masks limited the time children spent on outside movement activities. To address this, the participants started implementing short dances and movement activities inside the classroom. The participants concluded that movement activities in the classroom are possible, but that space and time availability were challenges. They expressed a need for further training on proprioceptive development and how it plays a role in school readiness.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF ACRONYMS AND EDITORIAL NOTES[1]

CAPS   Curriculum and Assessment Policy Statement

UNESCO   United Nations Educational and Cultural Organization

---

[1] APA 7th referencing style was used in this thesis.

CHAPTER 1: INTRODUCTION

1.1 INTRODUCTION AND RATIONALE

It is a well-known fact that the attrition rate of children who enter the education system in South Africa is very high with more than half of the children who entered Grade 1 not passing Grade 12. This includes children who did not pass the final Grade 12 examination and children who did not sit for the matric examination (Carney et al., 2019; Department of Basic Education [DBE], 2010; 2021; le Roux, 2020). Conversely, Statistics South Africa's 2018 General Household Survey found that approximately a quarter of the respondents to this survey cited low academic performance as the primary reason for dropping out of school. In 2015, the United Nations Educational and Cultural Organization (UNESCO) published an international report suggesting that by reforming school readiness, the repeat and dropout rates among children worldwide could decrease (UNESCO, 2015).

Various studies have found that physical, environmental and socioeconomic factors influence children' academic success in the future (Csapó, 2013; Davoudzadeh et al., 2015; de Franchis et al., 2017; Duncan et al., 2007; Pagani & Fitzpatrick, 2014; Quirk et al., 2017; Smith & Shepard, 1988[2]; Tavassolie et al., 2018). According to van Zyl and van Zyl (2011), when children start their formal schooling with impulse control, they are likely to improve their literacy and numeracy abilities. In addition, it has been found that children benefit from the appropriate development of many physical, emotional, social and cognitive skills which result in significantly more success in literacy and numeracy compared to their peers who lacked exposure to this development (Ahmed et al., 2019; Blair & Raver, 2015; Duncan et al., 2007; McClelland et al., 2007; McClelland & Cameron, 2012).

---

[2] The researcher acknowledges that this is an old source. Qualitative studies regarding school readiness and future academic achievement were, however, limited.

School readiness skills which are directly and indirectly influenced by proprioception are motor development, spatial awareness, directional awareness, body schema, knowledge of body parts, laterality, dominance, temporal awareness, synchronicity, rhythm, sequencing, handwriting, listening to instructions, hand-eye coordination and emotional and social regulation including gross motor skills, balance, coordination, fine motor skills (including handwriting and speech production) and midline crossing (Blanche & Schaaf, 2001; Koomar & Bundy, 2002; Loubser et al., 2016; Sheedy et al., 2021).

Furthermore, young children's ability to stay focused and concentrate on tasks has a considerable influence on their school performance (Chang & Burns, 2005; Wright et al., 2000) and, thus, tends to have a long-term effect on their adult health, employment and future expectations (Council of Economic Advisers, 2015). In addition to the aforementioned factors, sensory processing and its role in helping an individual make sense of their world is a vital part of providing the child with a context in their day-to-day tasks (Dunn, 2007; Romero-Ayuso et al., 2018; Zingerevich et al., 2009). All of these elements mature together with the child's motor development. As such, if a child is not developing age-appropriately in one of these areas of development, it is likely to have a negative influence on other areas of functioning (Gierat, 2012). Similarly, Duncan and Magnuson (2011) and Duncan et al. (2018) found that when there are deficiencies in performance during children's school careers, the cause can likely be found in gaps at the start of their formal schooling.

Teachers are often the first to notice when children are not ready to learn in a formal setting. Regrettably, there is currently limited research from an educational perspective regarding teachers' knowledge of proprioception and the role it plays in child development and, ultimately, school readiness. The researcher was, however, able to find some studies that addressed perceptual-motor skills and school readiness, sensory integration and processing and school readiness, and gross motor development and school readiness (Boyd & Sobieraj, 2013; Chu, 2017; Hutton, 2012; Jiang et al., 2018; Lewington, 2020; Loubser, 2015; Miles, 2018; Yildiz et al., 2020; van Zyl, 2016). The aforementioned studies did not, however, specifically address proprioceptive development and the importance thereof from Foundation Phase

teachers' perspectives. However, the researcher found a qualitative South African study by Meyburgh (2018), in which semi-structured interviews were used to explore Grade R teachers' perceptions of school readiness. In this study, half of the respondents mentioned physical readiness as an important element of school readiness. Another South African research study by Loubser (2015) ties in with these findings. Using questionnaires, Loubser (2015) found that less than half of her mixed methods study respondents realised that physical skills were essential for a child's academic success in Grade 1. Furthermore, they were unaware that perceptual skills, including proprioception, were equally important. The study also found that most of these teachers did not have sufficient training regarding the development of these skills. The lack of research and published material on the link between proprioception and school readiness points to a significant gap in our knowledge of how familiar Foundation Phase teachers are with proprioception and its role in school readiness.

From 2014 to 2017, while the researcher was teaching Grade 1 children at a government school in Olifantsfontein, Gauteng, she noticed that many children experienced challenges in the formal academic environment. These challenges included motor restlessness and hyperactive behaviour, struggling with reading and writing, physical challenges (such as balance) and difficulties with basic mathematical skills. These areas of difficulty prompted the researcher to explore opportunities for further training and development, which led to her discovery of the Mind Moves® programme. This is an evidence-based programme which allows trained advanced Mind Moves® instructors (AMMI) to identify the causes of learning difficulties and to intervene to enhance children' learning capacities (https://www.mindmoves.co.za). The researcher completed the AMMI training, which allowed her to also present training workshops to South African teachers.

Between September 2018 and July 2022, the researcher presented more than 40 workshops to teachers, explaining the neuroscience of learning based on the Mind Moves® principles. These principles include the importance of the inside senses (proprioception, the vestibular system and kinesis) and the role they play in child development. While presenting these workshops, the researcher found that Foundation Phase teachers appeared to lack knowledge of proprioception and how it

3

can be developed and encouraged in young children. It has been her experience that teachers who attended these workshops gained new insight into children' struggles with a wide range of barriers to learning in the classroom and how proprioceptive development was one explanation for these difficulties. Therefore, the researcher was curious to discover more about the knowledge that Foundation Phase teachers have about proprioception and its role in school readiness. The researcher was specifically interested in Foundation Phase teachers, mainly because of the significant role they play in the foundational preparation of children for future academic learning.

1.2 PURPOSE OF THE STUDY

The purpose of this exploratory case study was to explore and describe six Foundation Phase teachers' views on the role that proprioceptive development plays in school readiness at an independent primary school in Pretoria, Gauteng. At this stage in the research, proprioception is generally defined as the body's internal recognition and processing of signals from mechanoreceptors that enables a child to know exactly where their limbs are in relation to their own body, as well as the space around them and how much force to use when manipulating objects (Benn, 2017; Han et al., 2016; Hayton, 2017).

1.3 RESEARCH QUESTIONS

1.3.1 Primary Research Question

What are the views of six Foundation Phase teachers at an independent primary school in Pretoria on the role of proprioceptive development in school readiness?

1.3.2 Secondary Research Questions

- What knowledge do Foundation Phase teachers have of school readiness?

- What knowledge do Foundation Phase teachers have of proprioception?'

- What knowledge do Foundation Phase teachers have of the role that proprioceptive development plays in school readiness and which strategies do Foundation Phase teachers apply in their classrooms that may facilitate proprioceptive development?

- What future training needs do Foundation Phase teachers have regarding proprioceptive development and enhancement?

1.4 WORKING ASSUMPTIONS

This study was based on the following assumptions:

- To learn, we must be able to process and integrate sensory sensations and plan and organise our behaviour according to these sensations, therefore, Ayres' sensory integration theory will apply to this study.

- Proprioceptive development plays an important role in child development and school readiness in the physical, socio-emotional and cognitive domains.

- Foundation Phase teachers will have appropriate knowledge of school readiness due to their daily interactions and experiences with young children.

- A stimulating environment allows sensory integration, and thus also proprioceptive development to naturally occur.

- A qualitative methodology will provide the researcher with content-rich narrative information to answer the research questions.

1.5 CONCEPT CLARIFICATION

1.5.1 Proprioception

Han et al. (2016) define proprioception as the process of individuals determining their limbs' movement and position in the space around them. This definition ties in with occupational therapists' definition that proprioception is one's subconscious and conscious awareness of one's spatial movement based on feedback from joints and the body. As a result, the brain can recognise an individual's arms and legs without the individual looking at them. It also enables the individual to understand their location relative to objects in the environment without looking (Ayres, 1972; Ayres et al.,2005; Chu, 2017; Fisher et al., 1991; Hutton, 2012; Parham & Mailloux, 2015).

Furthermore, in neuroscience, proprioception is defined as a sense of body movement required for coordination and detecting environmental changes. With cumulative input from mechanoreceptors to the central nervous system, the body part's position can be evaluated by neurons that detect static and dynamic changes (Boisgontier & Swinnen, 2014; Ferlinc et al., 2019; Montell, 2019).

Physiologists, physiotherapists and physical scientists view proprioception as a crucial component in the ability to learn, play and execute motor actions. It refers to a person's personal sensation of the body and contributes to their sense of ownership of the body, its parts and their sense of self. Proprioception is a continuous feedback loop between sensory receptors throughout the body and the nervous system. It is generated by a person's own activities rather than by aspects of their environment, where senses such as vision, hearing or touch play an essential role (Heroux et al., 2022; Kaviraja, 2021; Proske, 2019; Vaishnavi, 2021).

For the purpose of this study, proprioception is defined as the body's internal recognition and processing of signals from the proprioceptors that enable children to know exactly where their limbs are in relation to their own body, as well as the space around them and how much force to use when manipulating objects (Ayres, 1972; Ayres et al., 2005; Han et al., 2016; Proske, 2019). It includes the effect that proprioception has on self-regulation and academic functioning (Hutton, 2012).

1.5.2 School Readiness

Various definitions for school readiness exist. Shaari and Ahmad (2018) define school readiness as a reflection of the degree to which children have mastered key developmental domains before entering primary school. Duncan et al. (2018) emphasise that both behavioural and cognitive skills are required for school readiness. Marti et al. (2018) define school readiness as a combination of knowledge and skills in areas such as literacy, maths and self-regulatory skills such as socio-emotional regulation, patience and focus. Dockett and Perry (2014) recognise school readiness as a means of determining how adaptive a child is on a social, emotional and intellectual level in order to succeed and actively participate in a formal learning environment, while Watts (2021) believes that children who are school ready are able

to thrive since the foundation has already been laid. Joshi et al. (2019) comment that there is a difference between school readiness and developmental readiness. According to the authors, the term 'readiness' refers to the stage in children's development when they are ready to learn in a formal, challenging setting without being disturbed by emotional disruptions. School readiness, in their opinion, would then allow children to be ready to attend formal learning settings, engage in academic activities and gain from these activities in a manner that supports their subsequent achievement. To be considered school ready, a child has to be developmentally ready. Developmental readiness is different from school readiness because the former does not only include a child's academic abilities but also readiness in other areas of development. It also includes the child's ability to cope with the challenges of a formal academic environment (Chandra, 2017; Joshi et al., 2019).

For the purpose of this study, school readiness will be defined as the physical, socio-emotional and cognitive skills children need to master to succeed academically and socially in a challenging formal, structured classroom environment (Bender et al., 2011; Chandra, 2017; Janse van Rensburg & Erasmus, 2016; Joshi et al., 2019; Millians, 2011; van Zyl,2011).

1.6 INTRODUCING THE THEORETICAL FRAMEWORK SUPPORTING THE STUDY

The sensory integration theory of Ayres (1972; 1989) guided this research study. Ayres (1972) developed this theory based on five brain development and integration assumptions. First, it is assumed that the brain is capable of neuroplasticity. Second, neural hierarchies play a role in directing sensory inputs. Third, the brain is assumed to operate as an integrated system. Fourth, feedback from adjustments or immediate responses affects brain self-organisation. Fifth, adaptive responses and self-organisation require an inner drive (Ayres, 1972, 1989; Bundy & Lane, 2020; Kielhofner, 2009; Smith Roley & Jacobs, 2009). Ayres (1972, 1989) believed that the brain can change and that this change can lead to the sequential development of sensory integration capacities. There is an interactive relationship between brain organisation and adaptive behaviour. Thus, sensory information integrates effectively when the cortical areas of the brain interact with the sub-cortical areas. The author

also believed that internal motivation drives participation in sensory-motor activities, thus fostering sensory information integration (Bundy & Lane, 2020; Kielhofner, 2009; Smith Roley & Jacobs, 2009).

According to the sensory integration theory, there are four levels of integration involved in developing functional skills that support proprioception's relevance in school readiness. The first level relates to infants receiving information through their near and far senses and their brains learning to interpret it. By moving more, infants become more confident, which leads to them experimenting with even more movement. At the second level of processing, toddlers start developing body awareness as their near senses start functioning together. This body awareness allows toddlers to develop sensory-motor skills and to become more efficient in their motor planning. Once children develop perceptual-motor skills, refine their spoken language and improve their foundational skills at the third level of processing, they are ready for formal academic learning. At the fourth level of processing, children are more focused and goal-oriented in their activities. Motor coordination, enhanced by the proprioceptive, vestibular and tactile systems, allows the children to have efficient gross and fine motor skills, visualisation, social competence, self-regulation and self-confidence (Ayres, 1972; 1989: Kranowitz, 2005; May-Benson & Schaaf, 2015).

The theoretical framework supporting this research study is discussed in more detail in Chapter 2.

1.7 OVERVIEW OF THE RESEARCH METHODOLOGY, APPROACH AND PROCESS

In this study, an interpretivist paradigm was used to guide the research inquiry to obtain a holistic understanding of Foundation Phase teachers' views on the role of proprioceptive development in school readiness. A qualitative research approach and exploratory case study design was used to obtain in-depth information from teachers' perspectives. Six participants were purposefully selected to provide insight into the study's research problem and a focus group was used to answer the main research question of the study.

Focus group audio recordings were used to document the data generated and these audio recordings were transcribed for data analysis. An inductive thematic analysis was used to interpret data derived from transcriptions of the audio recording and field notes.

A phased approach to inductive thematic analysis was used. This included familiarisation with the data, developing initial codes, finding themes, evaluating identified themes, defining and naming themes and finalising the analysis. As part of the quality criteria for the trustworthiness of this study, credibility, transferability, dependability, confirmability and authenticity are detailed in Chapter 3.

The ethical considerations for this study will be discussed in more detail in Chapter 3.

1.8 SUMMARY

This chapter introduced this study and provided the rationale behind and purpose of the study. The chapter provided key conceptual clarifications of the study and included the study's research questions and theoretical framework. Lastly, the chapter outlined the research methodology, approach and process used throughout this research. The literature reviewed in this study is presented in the next chapter.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter commences with a discussion of proprioception and the role it plays in human development. The chapter then focuses on school readiness, specifically on the domains of functioning and the skills needed for formal academic learning. The chapter continues with the factors that can influence school readiness and the importance of readiness for future learning and academic achievement. The role of proprioception in school readiness is discussed next, followed by the challenges when proprioceptive development is delayed and how proprioceptive development can be supported. The chapter explores literature on Foundation Phase teachers' knowledge of school readiness and proprioception. The final section of the chapter outlines Ayres' sensory integration theory, which guided this research.

2.2 WHAT IS PROPRIOCEPTION AND WHY IS IT IMPORTANT?

The term 'proprioception' originated in 1906 when the neurophysiologist, Sir Charles Sherrington, defined it as sensory information that is acquired from neuroreceptors that are rooted in joints, muscles and tendons (González-Grandón et al., 2021; Heroux et al., 2022; Sherrington, 1906). It is now known that proprioception is the sense of awareness gained through mechanoreceptors in the muscles and joints that produce proprioceptive processing when triggered by movement (Avci, 2017; Mulligan, 2014). Together with the vestibular system, proprioception is often referred to as the sixth sense or the inside sense which is used to interpret events and react to them appropriately (Avci, 2017). Proprioceptive processing includes gathering information about the position and movement of the respective limbs and the perception of that information. Bernstein and Nash (2008) explain that perception results from informational input which is integrated with how individuals make sense of their contexts.

The term 'proprioception' is regularly used synonymously with the term 'kinaesthesia'. It is, however, important to differentiate between these terms because they do not refer to the same construct (Cheatum & Hammond, 2000). At present, there is a general agreement among neuropsychologists that kinaesthesia refers to the feelings that appear when the muscles actively contract and the physical feeling of the body moving in space, excluding when the muscles are passive, while proprioception includes all the feelings associated with the moving or rested body's position in space (Blythe, 2005; Danna & Velay, 2015; Ebbesen & Olsen, 2018).

Proprioception is processed in the central nervous system. Mechanoreceptors in muscles, nerve endings, tendons, ligaments, articulatory capsules, vestibular apparatus and the skin detect information regarding changes in the muscles, and this sensory information is sent via the peripheral nervous system (spinal and cranial nerves) to the cerebellum. In the cerebellum, the information integrates with information sent via the vestibular system which contributes to the individual's postural control and sense of gravity (González-Grandón et al., 2021; Kaviraja, 2021; Proske & Gandevia, 2012; Sutela, 2018; Todd, 2018).

Proprioceptors – a group of mechanoreceptors that respond to position and movement and which receive stimuli from within the body – are partially responsible for the forming of body image and self-awareness. Body image includes the conscious perception of a body's shape, dimensions and parts. Body image should not be confused with body schema (Proske, 2019; Vasquez-Rosati & Cordero-Homad, 2021). Body schema is a blueprint of how the limbs interact with one another and the area around them. It is a compilation of actions revised whenever the body moves, which is stored mentally as an image. This image is built from a person's experiences, understanding and continuous information from the proprioceptive system (Cheatum & Hammond, 2000; Nathan & Kahaner, n.d.; Pillay, 2018; Proske & Gandevia, 2012). The proprioceptive system facilitates efficient and accurate motor performance by giving individuals awareness of where their body parts are without having to wait for visual feedback (Sutela, 2018).

When individuals are aware of the parts of their bodies in space, they can navigate effectively in their environments (Ferlinc et al., 2019; Suetterlin & Sayer, 2014). When the environment changes, the proprioceptors supply the brain with the information necessary to stabilise, adjust and support the body. This process is one of the essential tasks of proprioceptive feedback (Tuthill & Azim, 2018). Along with playing a crucial role in injury prevention, proprioceptive feedback is also necessary to heal and rehabilitate injuries to broken bones, injuries to the spinal cord and spinal adjustments (Ferlinc et al., 2019; Kröger, 2018; Vaishnavi, 2021). As the body ages, proprioception also changes, resulting in challenges with the body's position in space and impaired balance which may lead to more falls and injuries (Ferlinc et al., 2019).

Bilateral integration, the ability to sequence, good equilibrium and correct postural reactions and control are also influenced by the integration between the proprioceptive and vestibular systems (de Quirós & Schrager, 1979; Mailloux et al., 2011; van der Linde, 2019). Integration between the proprioceptive and vestibular systems enables good equilibrium and correct postural reactions and control (de Quirós & Schrager, 1979). Proprioception functions closely with the vestibular system and the tactile sense (Jenkinson et al., 2008). It is needed to develop gross motor skills, such as balance and coordination. Hutton (2012) mentions that proprioceptive input is considered soothing; thus, physical movement is an appropriate approach to calming an individual down.

Proprioception is a crucial component of motor development and control in children, as it has a significant function in planned movement, natural responses and the motor action of the reflexes. Along with visual feedback, it allows us to move towards a specific destination (Pillay, 2018; Proske & Gandevia, 2012). Furthermore, visual skills develop when children move their bodies and heads (Kranowitz, 2005). To understand the relationship between proprioception and school readiness, it is necessary to first understand school readiness and the importance thereof.

2.3 WHAT IS SCHOOL READINESS AND WHY IS IT IMPORTANT?

School readiness speaks to two broader areas of development. These areas are children's readiness to learn and their readiness for school. Despite the association

between learning and school readiness, the terms are associated with different aspects of early learning and education (Millians, 2011). Readiness for learning is essential for young children to succeed in school, be healthier physically and emotionally and be happy overall. Behavioural or emotional issues are less likely to surface in school-ready children, who are more likely to succeed academically as their school careers progress (Duncan et al., 2007; Joshi et al., 2021). Learning readiness refers to children's ability to learn purposefully and can be observed in their intrinsic motivation to extend and apply their learning beyond teachers' expectations. They tend to display an eagerness to learn, show positive attitudes towards learning, have focused concentration and excitement to perform tasks (Dangol & Shrestha, 2019; Millians, 2011; Thorndike, 1913). In addition, school readiness pertains to the physical, socio-emotional and cognitive skills children need to master to succeed academically and socially in a formal classroom environment (Bender et al., 2011; Janse van Rensburg & Erasmus, 2016; Millians, 2011).

School readiness is a complex construct which emanates from early childhood development (Niklas et al., 2018). Theories around school readiness have evolved extensively. These theories include the idealist or maturation theory, the environmental theory, the social constructivist theory and the interactionist theory (Basaran & Aksoy, 2020; Mtati, 2020; Meisels, 1998).

The idealist/maturation theory postulates that the maturation process in children could not be rushed or expedited because it is an organic process that happens over time. Thus, children are almost entirely responsible for their own school readiness. The solution suggested for children who, by these standards, are not school ready, is to give them more time to develop appropriately (Dockett & Perry, 2002; High et al., 2008; Noel, 2010; Winter & Kelley, 2008).

Similarly, the environmental theory suggests that the responsibility for being ready for formal academic learning lies with children and their parents. This view also focuses on children's learnt skills and classroom behaviour. Whether children lack certain skills can be determined through assessments, after which, time can be invested into

teaching the children these skills (Bickel et al.,1991; Dockett & Perry, 2002; High et al., 2008; Meisels, 1998; Meyburgh, 2018; Noel, 2010).

In contrast to the previous theories, supporters of the social constructivist theory emphasise the preparedness of the children's systems and their interpretation of readiness rather than the children themselves. These systems include the family, community and school, and each of these systems attaches a different social and cultural significance and expectation to the concept of readiness (Britto, 2012; Dockett & Perry, 2002; High et al., 2008; Meisels, 1998; Meyburgh, 2018)

The interactionist theory views readiness as a combination of children's abilities and knowledge and their systems' capacities to accommodate them. Therefore, children's context and their reciprocal influence on each other are all considered during this pivotal period of transformation. This theory is the most compatible with the current research on early child development, particularly the significance of early experiences and connections (High et al., 2008; Meyburgh, 2018; National Research Council, 2000). Ring et al. (2016) suggest that there should be an even broader approach, including the society and the environment where children spend their early years. Therefore, children's context and their reciprocal influence on each other should all be considered during this pivotal period of transformation. In the South African context, early childhood development is defined as "the process of emotional, cognitive, sensory, spiritual, moral, physical, social and communication development of children from birth to school-going age" (Department of Social Services, 2007, p. 28).

School readiness domains are considered the primary indicators of children's readiness for academic learning (Nzunda & Kurniati, 2021). The following section focuses on the various domains of functioning inside the child, of which proprioception is an essential part.

2.4 DOMAINS OF FUNCTIONING

Various studies found that school readiness consists of the following broad domains: learning strategies, physical development and health, communication and language (including literacy and numeracy), socio-emotional development and cognitive

development and general knowledge (Britto, 2012; Geiger, 2019; Kentucky Department of Education, 2018; LeBlanc, 2018; National Education Goals Panel, 1991; O'Farrelly et al., 2020; Sadeghi, 2019; Teleková & Marcineková, 2020). Children's development outcomes across physical, socio-emotional and cognitive domains should be measured to determine their relative readiness for school (Independent Evaluation Group, 2015).

Within these different domains, there are specific skills that children should acquire. The following section will explicate these skills which leads to a discussion of how these skills relate to proprioception.

2.4.1 Physical Domain

Children's physical development is usually a good indicator of whether or not their development matches their chronological age since it is the easiest to observe in young children (Berk, 2019; Harcourt, 2018; Louw & Louw, 2007). Children develop fundamental movement patterns between the ages of one and seven. During this phase, they experiment with their bodies and discover how they can move (Clark & Metcalfe, 2002; Goodway et al., 2019). For children to be ready for school, they should have mastered specific skills and abilities (Nzunda & Kurniati, 2021).

From a physical perspective, gross and fine motor skills enable children to participate safely in developmentally appropriate activities (Gullo, 2018; Joshi et al., 2019). Gross motor skills involve using the body's large muscles to execute more prominent movements (Joshi et al., 2019). Since larger muscles develop more rapidly and earlier than finer muscles, gross motor skills develop first (de Witt, 2016). Gligorovic et al. (2011) state that there is an undeniable connection between children's balance and their competency in accurately copying shapes. Postural control ensures that the head, eyes and limbs can move precisely. Furthermore, to guide the coordinated movement of hands and fingers, the postural system provides stability to acquire data about the environment, thus playing a crucial role in reading and spelling (Botha, 2019; Flatters et al., 2014; Miller et al., 2007).

Fine motor coordination allows children to do small, precise tasks by mastering the control over small muscles along with eye and hand movements (Daly et al., 2003). This coordination enables children to learn the skills of reading, writing and arithmetic within a formal learning environment. Children can adjust more comfortably to the new pressures of a formal learning environment when their coordination is better developed (Gierat, 2012). However, when children experience challenges in their movement coordination, it results in a lack of body schema (Krog & Kruger, 2011).

Body schema and awareness relate to spatial awareness, which can be described as the ability to perceive the body's position and orientation in space in relation to other objects (Elena et al., 2014; Loubser et al., 2016). Spatial awareness allows children to experience how their bodies move up, down, under and inside objects. This experience enables them to differentiate between different numbers, letters and symbol orientations. Research has found a correlation between spatial skills and Mathematics (Cheng & Mix, 2014; Cornu et al., 2017; Gunderson et al., 2012; Skagerlund & Träff, 2016; Zhang et al., 2014; Zhang & Lin, 2015). Children who adequately developed spatial skills when they started First and Second Grade experienced more success in their number line activities in those years. It has also been demonstrated that spatial skills are necessary for mental rotations, affecting how children determine equations and do mental maths (Cornu et al., 2017).

Similarly, distinguishing left from right (laterality) is necessary for a child to be ready for formal academic learning because the left and right hands must work together independently when the child writes (Cheatum & Hammond, 2000). Krog and Kruger (2011) comment that children with challenges in their laterality might struggle with reading from left to right, knowing which side of a book is the top and which is the bottom, and might also find it difficult to read words which contain letter combinations. Children's dominance is established when they present a lateral preference regarding their eyes, hands and feet (Botha, 2019; Cheatum & Hammond, 2000). After that, children can extend this understanding to other objects and people. This comprehensive understanding is known as directionality which, along with laterality, needs proper body awareness before being established (Cheatum & Hammond, 2000). Directionality consists of three planes, divided by imaginary midlines into equal

parts: left/right, up/down and front/behind. Children can learn these directions when their body knowledge and laterality have properly developed (Pheloung, 1997).

Children who are adept at crossing the left/right midline will be able to effortlessly move a body part from one side to the other side of the body in order to execute a task (Jacobs et al., 2021). Various motor and cognitive skills depend on this skill for advancement (Jacobs, 2020). Children who cannot cross their midline might experience overwhelming challenges with gross and fine motor skills needed for formal academic learning (Cheatum & Hammond, 2000; Feder & Majnemer, 2007; Jacobs, 2020; Krog & Kruger, 2011; Scharoun & Bryden, 2014).

Coordinating small muscle movements allows children to do small, precise tasks and work accurately and proficiently (Oberer et al., 2018). The small muscles achieve this along with the eyes and hands working smoothly together to carry out activities like pencil gripping, buttoning and unbuttoning, cutting and writing (Daly et al., 2003; Joshi et al., 2019). Although handwriting is not explicitly mentioned as a school readiness skill, it is a fine motor skill that may affect long-term academic success on many levels (Dinehart, 2015). Feder and Majnemer (2007) suggest that children who experience challenges with handwriting might not be able to achieve their abilities, as they might not be able to keep up with the work speed of their class.

Visual-motor integration involves coordinating visual perception with fine motor control, in other words, when the eyes and the fingers cooperate to participate in activities (Nesbitt et al., 2019). Research by Grissmer et al. (2010) and Sperling and Head (2002) suggest that when younger children have well-developed visual-motor integration, it affects their later ability to adapt to a formal schooling environment. This adaption includes the capacity to focus, follow directions, do assignments and read effortlessly, and improve social behaviour and executive functioning. As children learn to perform increasingly complex tasks, they become more proficient. The confidence they gain when they successfully navigate new tasks and are praised for it leads to them being braver and seeking opportunities to learn new skills (de Witt, 2016; Erikson, 1963). Emotions thus play a crucial role in early learning and eventual school readiness.

2.4.2 Socio-emotional Domain

Emotional development begins at birth and continues throughout childhood and adolescence. It is the ability to regulate feelings and express them appropriately. Several factors influence children's emotional development, including their ability to relate to others and their feelings about themselves. There are a few basic emotions that all infants experience. These include fear, anger, pleasure and distress. With development comes differentiation in emotions and better emotional regulation (Bredekamp, 2017; Fabes et al., 2002). This may lead to the development of a positive self-concept and self-esteem. Children's social and emotional readiness for schooling requires substantial emotional resources, such as a parent or caregiver who is emotionally available and can provide guidance and support. Among the factors contributing to social development is the ability to have friendships and cooperate and resolve conflicts with others (Bredekamp, 2017; Pitcl et al., 2006).

Children who look forward to the formal learning environment and who are interested in the learning that will take place feel secure and emotionally ready for school. The feelings of motivation and security enable children to approach their new environment without fear, allowing them to transition smoothly and adapt quickly (Astbury, 2009; Teleková & Marcineková, 2020). Children who can regulate their emotions tend to cope better with separation from their parents. They can regulate and voice their own emotions, recognise their peers' emotions and respond appropriately. In turn, these children tend to be more participative in classroom activities, attain higher marks, learn better and score higher on tests (Gumora & Arsenio, 2002; Hamerslag et al., 2018; Harrington et al., 2020; Widyaning et al., 2019).

Focusing during lessons and learning activities, obeying rules, following instructions and communicating with classmates play a crucial role in learning and academic success. This self-regulation is also necessary for socio-emotional school readiness (Blair & Raver, 2015; Duncan et al., 2018; McClelland & Tominey, 2015). By supporting children's self-regulatory skills, teachers can support their school readiness (Blair & Raver, 2015). Through self-regulation and the ability to pay closer attention, children may grasp the basics of reading and Mathematics faster than children who are not

paying attention or acting impulsively (Bodovski & Youn, 2011; Pan et al., 2019). Emotionally unprepared children entering the formal school system may experience challenges with their ability to adjust to school and develop self-confidence (Fauconnier, 2006).

Furthermore, children learn to express themselves according to the customs of their culture. Thus, we see a close correlation between language development and the socio-emotional aspect (Kagan et al., 1995; Meyburgh, 2018). Cognition and social development do not exist in separate brain compartments, and it is impossible to separate these aspects of development from each other (Bredekamp, 2017).

2.4.3 Cognitive Domain

Cognitive development refers to the changes in how children think about the world, including how they reason, use language, solve problems and learn. It includes perception, memory, decision making, imagination and creativity (Bredekamp, 2017; Dyer, 2002; Louw & Louw, 2019). Joshi et al. (2019) define children's cognitive readiness as the ability to take specific concepts they have learnt and identify the themes and connections between them. This process of meaning-making starts when children learn skills such as observation, schematic thinking, voluntary learning and causality.

Turnbull et al. (2022) emphasised the importance of cognitive skills for children's school readiness. Development in these areas positively affects children's emergent literacy and numeracy skills, influencing their later achievement in reading, writing and Mathematics (Gullo, 2018; Kagan et al., 1995; Welsh et al., 2010). Cognitive skills can be domain-specific, such as basic reading and mathematics skills, and domain-general, such as mental flexibility and the ability to plan (Turnbull et al., 2022). Existing literature suggests that children's early mathematical and literacy abilities and self-regulation are pivotal for children to find classroom instruction constructive and achieve accordingly (Blair & Raver, 2015; Duncan et al., 2007; McClelland & Cameron, 2012; Samuels et al., 2016). According to Rittle-Johnson et al. (2019), the ability to

work with patterns and sequences indicates emerging numeracy and is thus seen by some teachers as an essential school readiness skill.

Lastly, language skills play an essential part in classroom communication (Pan et al., 2019). These skills include but are not limited to expressive and receptive language, a comprehensive vocabulary, letter and word recognition and beginner's writing skills. Generally, children's academic success at various age intervals depends on developing these language skills (Burchinal et al., 2020; Kokkalia et al., 2019).

2.5 FACTORS THAT INFLUENCE SCHOOL READINESS

As stated in Chapter 1, historically, more than half of the children in South Africa who enrolled in Grade 1 did not pass Grade 12. These findings are supported by various studies that have reported on the significance of school readiness on later academic achievement (Csapó, 2013; Davoudzadeh et al., 2015; de Franchis et al., 2017; Duncan et al., 2007; Pagani & Fitzpatrick, 2014; Quirk et al., 2017; Smith & Shepard, 1988; Tavassolie et al., 2018). These studies, among others, have identified various factors, including but not limited to physical, environmental and socioeconomic factors related to children's academic future success. The following section will discuss these factors.

2.5.1 Physical Factors

Birth weight and gestation age are related to health status during pregnancy and birth. Children born prematurely are more susceptible to lower cognitive achievement when they reach the appropriate age for formal schooling (Bhutta et al., 2002; Gullo, 2018). Furthermore, children with health challenges or whose parents experienced health challenges were more at risk regarding their eventual school readiness (Janus & Duku, 2007; Ring et al., 2016). Health challenges might be further affected by the socioeconomic status of the child's family and if they have access to the medical care they need. The role chronological age plays in school readiness has also been researched extensively and it has been found that children who enter preschool at younger ages performed lower than their older peers in academic performance measures. Additionally, individual development and mental readiness are positively

correlated with chronological age (Dockett & Perry, 2002; Gullo, 2018; Miller & Kehl, 2019; Retnawati et al., 2021).

2.5.2 Socioeconomic Factors

Socioeconomic factors influence school readiness in a multitude of areas. Besides lacking crucial nutrition and medication, there might also be a lack of resources needed to prepare children for school. In resource constrained communities, children might also encounter negative behaviours, attitudes and approaches that undermine their future academic success (Bradley & Corwyn, 2002; Gullo, 2018; Hill et al., 2004; Ring et al., 2016). Sadowski (2006) comments that there are regular inconsistencies in children's academic performances when measured by race and ethnicity; however, they further note that the role socioeconomic status plays in these children's readiness for school needs to be considered. Duncan and Magnuson (2005) suggest that as much as socioeconomic status plays a role, so does the family's access to socioeconomic resources of income, education, family structure and neighbourhood conditions.

As a result of high stress levels and socioeconomic challenges, many children still enter the school system unprepared, especially in South Africa. Therefore, they may be teased and ridiculed by their classmates, struggle to achieve academically and, later, drop out of school (Samuels et al., 2016; van Zyl & van Zyl, 2011).

2.5.3 Environmental Factors

The quality of schooling, as experienced in different areas and by different races, may negatively influence academic achievement (Quinn, 2015). Maternal education is one of the most consistent parent-level predictors of children's school readiness. The likelihood of a child with a mother with higher levels of education receiving formal childcare before starting preschool is double that of a child with a mother with lower levels of education (Reid & Strobino, 2019). Furthermore, inadequate school readiness directly affects future education, associated with unemployment and severe misconduct (Burchinal et al., 2015; Pears et al., 2014).

Children who experience the classroom as a positive environment because of their interactions with classmates and teachers might also be more eager to participate in the learning activities. This positive engagement will inadvertently lead to more substantial academic performance. For these positive interactions to occur, children need to have well-developed social and interpersonal skills. Furthermore, these skills can indicate future academic and career success (DiPerna et al., 2014; Houri & Miller, 2020; Jones et al., 2015). Likewise, van Zyl (2011) and Csapó (2013) found that children who were ready to enter formal schooling were likely to remain academically strong, even after eight years, but children who were not coping in first grade were still struggling in Grade 7.

2.6 WHY IS PROPRIOCEPTION IMPORTANT FOR SCHOOL READINESS?

As stated earlier, proprioception plays an essential role in child development and school readiness in the physical, socio-emotional and cognitive domains. School readiness skills, influenced directly and indirectly by proprioception are motor development, spatial awareness, directional awareness, body schema, knowledge of the body parts, laterality (sense of direction), midline crossing, dominance, temporal awareness, synchronicity, rhythm, sequencing, handwriting, listening to instructions, hand-eye coordination and emotional and social regulation (Blanche & Schaaf, 2001; Koomar & Bundy, 2002; Loubser et al., 2016; Sheedy et al., 2021). This section will discuss how proprioception influences various school readiness skills.

2.6.1 Proprioception and Motor Development

Sensory stimulation leads to perceptual awareness which leads to motor development. A well-developed sensory system develops gross and fine motor skills and other skills crucial for formal academic learning (de Jager, 2014; Pienaar et al., 2011). Furthermore, with adequately developed proprioception, children are less reliant on visual feedback, affecting their balance and posture. Good balance, in turn, positively affects reading and how children copy shapes and thus also letters, numbers and symbols (Gligorovic et al., 2011). In order to accomplish postural control, proprioceptive, vestibular and visual indicators need to be integrated (Hansson et al., 2010).

2.6.2 Proprioception and Spatial Awareness

Proprioception, as an inside sense, influences spatial and temporal awareness. Body awareness and balance develop from appropriate spatial awareness (Botha, 2019; Gligorovic et al., 2011; Wan Yunus et al., 2015). Spatial awareness allows children to understand where and how their bodies move in the space around them, allowing them to understand how their bodies relate to other external objects and how they relate to each other. Furthermore, as an understanding of personal and general space develops and children become familiar with how their bodies relate to their inner and outer worlds, they also start developing directional awareness (Gallahue & Cleland-Donnelly, 2003; Loubser et al., 2016). Directional awareness encompasses laterality and midline crossing. Awareness of the left and right sides allows children to differentiate between which side of the body is moving and when it is moving without visual cues. With established laterality, children can cross their imaginary vertical midlines, allowing for comfortable bilateral movements (Gallahue & Cleland-Donnelly, 2003; Grové & Hauptfleisch, 1978; Loubser et al., 2016; Suggate & Martzog, 2020). These also affect the establishment of hand dominance (Loubser et al., 2016; Suggate & Martzog, 2020). Spatial awareness and spatial visualisation might affect mathematical understanding on many levels (Hawes et al., 2019). Spatial skills and the repetition of patterns could predict children's knowledge of mathematics and later achievement (Mix & Cheng, 2012; Rittle-Johnson et al., 2016, 2019).

2.6.3 Proprioception and Temporal Awareness

Proprioception affects temporal awareness, allowing children to understand time, synchronisation, rhythm and sequences or patterning. It directly affects the eyes' coordination with the hands and the feet (Gallahue & Cleland-Donnelly, 2003; Loubser et al., 2016). Research by Idoni et al. (2014) adds to this by stating that the process of visual-motor integration needs proprioception to ensure that tasks are completed accurately. Eye movements, and thus the strengthening of the eye muscles, contribute to the development of additional neural pathways. However, eye movements result from information collected via the vestibular sense and proprioceptors (Karabulut, 2013).

2.6.4 Proprioception and Hand-Eye Coordination

An example of proprioception's role in learning can be seen in older children who have well-developed eye-hand coordination. Their perfected coordination, and thus controlled movement, allows them to coordinate proprioceptive input and visual information (Seefeldt, 1986). As mentioned before, physical movement engages both of these senses and thus, considerably strengthens neural connection development.

2.6.5 Proprioception and Concentration

Proprioceptive input triggers the cerebellum into alertness which influences emotional and self-regulation skills which in turn influences concentration (Luborsky, 2017). Buckle et al. (2011) found that children who moved around in the classroom and had slow task completion were in fact seeking proprioceptive input. Concentration was thus a challenge as they battled to stay in their seats in their efforts to seek out proprioceptive input. The authors found that by giving the children in their study weighted vests which offers proprioceptive feedback, they were able to remain seated and concentrate longer.

2.6.6 Proprioception and Emotional Regulation

Blair and Raver (2015) state that once children can regulate their own emotions and attention to the point where they can stay interested in the learning activities for a more extended period, they are ready to go to school. Researchers have also associated social interaction skills and the ability to self-regulate with well-developed proprioception. They acknowledged proprioceptive input's potential to calm children with sensory challenges (Beatson, 2020; Blanche & Schaaf, 2001; Koomar & Bundy, 2002).

2.6.7 Proprioception and the Vestibular System

Cheatum and Hammond (2000) state that the proprioceptive, visual and vestibular systems are so elaborately connected that, should one of the systems not be working efficiently, the brain can still use adequate information from the other two systems to keep the body stable. However, when children have problems with their vestibular system, they are also likely to have challenges with their proprioceptive system. A lack

of adequate proprioceptive feedback can result from either disrupted or underdeveloped proprioception (Todd, 2018). When the proprioceptive sense is underdeveloped and children are not receiving the correct proprioceptive information, they may appear clumsy and uncoordinated (du Plooy, 2017; Milicev & Vukuvic, 2017; Parham & Mailloux, 2015). Children who are not attending school yet, display a far less developed kinaesthetic capacity when their motor coordination is underdeveloped (Coleman et al., 2001).

2.7 SIGNS OF UNDERDEVELOPED PROPRIOCEPTION

Underdeveloped proprioception is evident when children constantly fidget. Their fidgeting can result from inadequate body awareness, resulting in posture challenges. Children tend to fidget when they are subconsciously trying to compensate for body pains and soreness caused by these posture challenges. The fidgeting and movement take up a lot of the child's attention and energy, and there is, thus, not much left for the process of learning (Wernicke & Kalbantner-Wernicke, 2016). Children with proprioceptive difficulties cannot recognise where they are in space, and thus their bodies are constantly moving. Examples of these movements are swinging their legs or wrapping their feet around the legs of their chairs. Other signs of a possible proprioceptive disorder are that their drawings of people lack body parts, and they battle to keep their eyes closed and balance on one leg. They might also display a perceived fear of the dark because they do not know where their bodies are in space when it is dark (Johnson & House, 2014).

Tactile-proprioceptive input and visual information are required for accurate fine motor skills. It is, however, possible to carry out sufficient fine motor activities without visual feedback if the proprioceptive input is accurate (de Michael, 2016). These fine motor skills include cutting, writing and speech production. There is a potential connection between a weaker pencil grasp and challenges in proprioception. Proprioceptive feedback gives the child an indication of how much pressure to apply to the pencil, how tightly to grip the pencil, the movements to follow for letter formation and the movements to follow stabilising the book with the other hand. Because of the swift and focused feedback provided by the proprioceptive system, it might be even more effective than visual perception when children are writing (Cornhill & Case-Smith,

1996; Dennis & Swinth, 2001). Furthermore, an underdeveloped proprioceptive system can, for example, result in a child rubbing the eraser so hard that the paper tears. Children's writing ability is maintained by their immediate stability and this, in turn, results from their proprioceptive system's ability to give their brains information about where their limbs are in space. When this system works appropriately, the brain and body can maintain balance automatically, leaving room for concentration on learning and writing, amongst other things (Johnson, 2015).

Children who move around in the classroom and have slow task completion may be seeking proprioceptive input (Buckle et al., 2011). Not knowing their position in space leads to children not leaving the correct spaces between letters, words and sentences, and they struggle to write between the lines (Feder & Majnemer, 2007; Goodwin, 2015; Johnson, 2015).

Other challenges that can result from proprioceptive problems include struggling to locate and name the different body parts, struggling to get dressed, struggling to remember any instructions that have to do with motor skills and an apparent inability to coordinate eye movements. Children with proprioceptive challenges also seem unaware when they are touching other children, prefer playing with children much younger than them and are constantly moving or touching different parts of their bodies to wake them up (Krog & Kruger, 2011).

Kranowitz (2005) mentions that it is unlikely that children will have challenges with only their proprioceptive systems in isolation. Children with impaired proprioception will most likely also have tactile or vestibular challenges.

2.8 ACTIVITIES TO ENCOURAGE PROPRIOCEPTIVE DEVELOPMENT

The development of sensory integration occurs naturally in most children during their childhood. Some, however, do not develop sensory integration as effectively as others. Furthermore, due to the development of technology, children spend increasing amounts of their free time working on screens instead of participating in activities that support gross motor skills and postural control. In the lower grades, academically oriented activities and written tasks are prioritised, which means less time for free play

and exploration. Several studies have shown that regular activities that provide proprioceptive input can improve coordination in children, sensory integration and emotional regulation, and prevent inappropriate sensory seeking behaviour. Participating in sensory integrative activities and engaging children in tactile activities that involve the senses can improve and enhance children's attention (Akbar, 2020; Clements, 2004; Katzenellenbogen et al., 2021; Sánchez-Lastra et al., 2019).

It is beneficial that children follow a consistent classroom routine, with carefully planned transitions and movement breaks throughout the day. Teachers can add planned movement, rhythm, poems and songs during these breaks. These movement opportunities give children the structure to fidget, move around, and stimulate their proprioceptive system. Fast, rhythmic stimulation affects children's arousal levels and alertness, and slow, rhythmic stimulation calms them (Kranowitz & Silver, 1998; Recoder, 2019; Saunders, 2005).

Proprioceptive exercises stimulate the muscles, and children can benefit from doing these activities before they start writing (Deisher & Hikes, 2016). Various activities can be incorporated into the daily structures and routine of the young child to support the development of the proprioceptive system. Children can lift and carry or push and pull loads of varying weights in the classroom. During short breaks, in between learning blocks, they can do physical movements, such as jumping jacks, jogging on the spot, star jumps, chair push-ups or wall push-ups. After more challenging activities or during more peaceful moments, children can be encouraged to give themselves hugs, hand massages or do some stretching. When children go outside, there should be ample opportunity to engage in big, physical movements such as monkey bars, crawling over an obstacle course, playing tug-of-war, hopscotch, playing leapfrog, skipping or balancing activities. At their desks, children can be encouraged to drink using a straw, wear a weighted vest or blanket, squeeze stress balls, sit on a therapy ball or step on a TheraBand around the legs of their chairs (Akbar, 2020; Case-Smith, 2010; Kaviraja, 2021; Kranowitz, 2005; Recoder, 2019; Vaishnavi, 2021).

In addition, children can be referred to occupational therapists or external programmes, such as Brain Gym, which can give the child proprioceptive stimulation through selected sensory activities (Keen, 2011).

2.9 FOUNDATION PHASE TEACHERS' KNOWLEDGE, PERCEPTIONS AND VIEWPOINTS OF SCHOOL READINESS AND PROPRIOCEPTIVE DEVELOPMENT

As stated in Chapter 1, the researcher was able to find some studies related to perceptual-motor skills and school readiness, sensory integration and processing, and gross motor development, as well as some studies related to sensory processing skills and school readiness. These studies suggested that children's ability to process sensory information may play a role in the challenges they experience in the classroom. Some of these studies focused on perceived gaps in the knowledge and training of teachers concerning sensory processing and development (Boyd & Sobieraj, 2013; Erasmus et al., 2016; Harcourt, 2018; Hutton, 2012; Jiang et al., 2018; Lewington, 2020; Loubser, 2015; Van Zyl, 2016). The findings of the various studies are discussed in more detail in the paragraphs below.

A survey study by Loubser in 2015 on the effect of a learner-support intervention on perceptual-motor skills of preschool learners from deprived environments, determined that 48% of the Grade R teachers who participated understood the importance of physical activity, such as running and jumping and rhythm and coordination. However, they were unaware that perceptual-motor skills (including proprioception) were also crucial for school readiness, nor were they aware of the role these skills play in language and Mathematics. This lack of knowledge could be attributed to a lack of training identified in 80% of the participants. Furthermore, it was found that there was a statistically significant connection between the participants' lack of knowledge regarding perceptual-motor skills and the school readiness of their Grade R children.

Harcourt's study on the effect of a perceptual-motor intervention on the school readiness of Grade R learners (2018) determined that the school readiness levels of Grade R participants improved as a result of a perceptual-motor intervention programme that was used in their research. More specifically, there was an increase

in school readiness scores in language, cognitive thinking, auditory perception, body awareness and eye-hand coordination following the adoption of the perceptual-motor intervention programme. However, the teachers who participated in the study emphasised language and mathematical skills more than any other skills needed to be ready for formal academic learning.

In their study regarding the effect of a perceptual-motor intervention programme on the learning readiness of Grade R children from resource constrained environments, Erasmus et al. (2016) recommended that training in drafting and applying perceptual-motor intervention programmes will benefit Grade R teachers. Moreover, they also determined that perceptual-motor intervention programmes can be used to benefit Grade R children. These intervention programmes may address the gaps in learner development to better prepare them for the formal academic learning environment.

In the Foundation Phase, teachers' knowledge of school readiness is essential because they are important role players in the context in which the child participates in formal academic learning. Research on teachers' perceptions regarding the implementation of school readiness assessment instruments identified several skills teachers deemed necessary for children to succeed in Grade 1. These skills included but were not limited to, physical development, gross motor skills, fine motor skills, perception, language and mathematical abilities and independence (Yzel, 2017). Harcourt (2018), however, encountered participants who considered school readiness as limited to cognitive development only and not inclusive of other domains such as physical, emotional or moral development. In a South African study, conducted in a rural area, Vermaas (2010) found that many of the 1st Grade teachers participating had limited awareness of the gross motor, fine motor and cognitive skills of children. Although the participants were aware that children's attention spans are essential for formal learning, they were uncertain about the age-appropriate time span of this concentration.

In research by Pillay (2018), participating teachers regarded physical education as a positive part of children's development. However, they did not have adequate knowledge of why it was necessary. When asked, they did not know much about the

vestibular and proprioceptive systems or perceptual skills and its contribution to learning. They also did not have knowledge about the skills affected by physical movement. Further research is needed on whether South African universities address proprioception as part of their teacher training curriculum. In addition, teachers need to engage in regular professional development activities, particularly in-service training, because it is vital for classroom practices (Ajani, 2019).

2.10 THEORETICAL FRAMEWORK

In this study, the sensory integration theory of Ayres (1972, 1989) served as the theoretical framework for exploring the role proprioception plays in school readiness. This theory postulates that sensory information is not processed in isolation because visual and auditory processing are dependent on the body-centred senses. Therefore, therapeutic interventions that affect multi-sensory perception will influence learning and behaviour (Ayres, 1961, 1972a, 1972b, 1972c, 1972d; Smith Roley & Jacobs, 2009). To learn, we must be able to process and integrate sensations and plan and organise our behaviour according to those sensations. A decreased ability to process and integrate sensation can negatively affect learning and behaviour. However, learning and behaviour are enhanced when sensory input is generated and integrated into the context of a challenging environment (Bundy & Lane, 2020).

Ayres (1972) based the sensory integration theory on five assumptions. The first assumption is that, as a result of ongoing sensory experience, the brain is thought capable of changing. This change in the brain is also referred to as neuroplasticity (Bundy & Lane, 2020; Kielhofner, 2009; Smith Roley & Jacobs, 2009). The second assumption is that sensory integration capacities develop sequentially as a result of typical brain development and sensory experience interacting. Although the brain's developmental sequence is largely biologically determined, sensory processing also plays an essential role in organising its biological potential during development (Bundy & Lane, 2020; Kielhofner, 2009; Smith Roley & Jacobs, 2009). The third assumption is that the brain operates as an integrated system. Thus, to integrate sensory information effectively, cortical brain areas must interact with sub-cortical areas (Bundy & Lane, 2020; Kielhofner, 2009; Smith Roley & Jacobs, 2009). The fourth assumption is that an interactive relationship exists between brain organisation and adaptive

behaviour. Because of the feedback to the central nervous system, this adaptive response promotes higher levels of integration (Bundy & Lane, 2020; Kielhofner, 2009; Smith Roley & Jacobs, 2009). The fifth assumption is that individuals participate in sensory-motor activities out of internal motivation to master challenges that foster sensory information integration (Bundy & Lane, 2020; Kielhofner, 2009; Smith Roley & Jacobs, 2009).

The process of sensory integration organises the body's senses and those of the environment to enable one to use the body effectively. Four levels of integration are involved in developing functional skills. At the first level of integration, babies' sensory systems continuously absorb information. Babies receive information through their near senses (touch, smell, taste, hearing and sight) and far senses (tactile, vestibular and proprioceptive senses). The baby's senses must be adequately stimulated at this level to ensure the flow of impulses from the receptors to the brain. A baby's brain can only interpret touch sensations correctly if they are in physical contact with their caregiver. This allows them to form their first emotional attachment to their caregiver and associate positive activities, such as eating and smiling with positive feedback. Babies receive information about their movements through their vestibular and proprioceptive senses. Through their movements, babies become more confident and, as a result, continue to move more (Ayres, 1972, 1989; Kranowitz, 2005; May-Benson & Schaaf, 2015).

Body awareness starts developing at the second level of processing. This happens when the near senses start functioning together smoothly. With establishing body awareness, the toddler's posture, balance and gravitational security emerge, followed by bilateral integration, lateralisation, hand preference, midline crossing and postural response stability. Toddlers also develop neck stability, which keeps their eyes steady as they learn to coordinate their movements. The toddler starts rolling and then crawling, alternating hands and legs, thus stimulating bilateral coordination. In addition to the maturing tactile, vestibular and proprioceptive senses, the toddler is also becoming more proficient at motor planning. During this stage, toddlers focus primarily on sensory-motor skills, resulting in an enhanced attention span and a feeling of security. As a result of motor planning, toddlers can adapt to new and unfamiliar tasks

as they develop and eventually, movements become automatic. When vestibular, proprioceptive, tactile and near senses are functioning effectively, efficient motor planning can occur (Ayres, 1972, 1989; Kranowitz, 2005).

Perceptual-motor skill development takes place at the third level of processing where children (between the ages of three and six years) start understanding information on a more cognitive level. Their senses start developing separately but also in coordination, allowing them to better understand the world around them and enabling them to start the process of learning. Children can now not only understand what they hear, but they can also communicate using spoken language. Their ability to interpret visual data improves and they develop a better understanding of spatial relationships. Children develop their eye-hand coordination while continuing the process of developing and improving their foundational skills. Finally, the child is ready for formal academic learning (Ayres, 1972, 1989; Kranowitz, 2005).

Children are ready for academic learning at the end of this sensory integration process. At the final level of processing, children are more focused and goal-oriented in performing activities. The proprioceptive, vestibular and tactile systems enhance motor coordination, allowing for efficient gross and fine motor skills, visualisation, social competence, self-regulation and self-confidence (Ayres, 1972, 1989; Kranowitz, 2005).

This theory was relevant to this study and the field of educational psychology because Ayres used the knowledge she gained from her doctoral work in educational psychology and combined it with neuroscience, psychology, human development and occupational therapy to explain learning and behaviour holistically (Bundy & Lane, 2020; May-Benson & Schaaf, 2015; Smith Roley & Jacobs, 2009). This study was guided by the development and integration of the sensory system and the ultimate effect on children's formal academic learning.

2.11 SUMMARY

In this chapter, an overview of proprioception, along with an overview of school readiness was provided to build a comprehensive background of how proprioception influences school readiness. Furthermore, teacher education and further professional development were highlighted to provide the background to how their views regarding proprioception's influence on school readiness were informed. Particular reference was made to the role early childhood development and sensory integration play in preparing children for formal academic learning. As the theoretical framework, Ayres' sensory integration theory supports the relevance of early childhood development in school readiness. The following chapter discusses the research approach, data collection methods and data analysis and interpretation. It also outlines the quality criteria and ethical considerations of the study.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

In Chapter 1 an overview of the research methodology for this study was provided. In this chapter, the research methodology will be explained in detail. The chapter commences with a presentation of the paradigmatic perspective and methodological paradigm followed in this study. Next, the research design followed by the selection of the research participants, the data-generating methods and how the data were documented, analysed and interpreted are presented. The chapter concludes with the steps taken to ensure the rigour of the study and the ethical considerations adhered to in this study.

3.2 PARADIGMATIC PERSPECTIVE AND METHODOLOGICAL PARADIGM

The paradigmatic perspective and methodological paradigm for this study are discussed in this section.

3.2.1 Paradigmatic Perspective

An interpretivist paradigm was used in this study. Interpretivism and constructivism are sometimes used interchangeably (Mack, 2010). Because interpretive researchers employ a very different approach to positivist researchers, it is also frequently called anti-positivism (Phothongsunan, 2010). Interpretivist researchers draw heavily from hermeneutics and phenomenology (Mack, 2010). Although students of hermeneutics were initially concerned with analysing and interpreting ancient texts, interpretive studies have indicated that this can also be expanded to the analysis and interpretation of qualitative data (Phothongsunan, 2010). A hermeneutic researcher seeks to understand how people and texts merge to bring about new meanings (Nigar, 2020). The aim of the phenomenological paradigm is for the researcher to gain a deeper understanding of the world through direct observation of phenomena (Alharahsheh & Pius, 2020). Furthermore, phenomenological researchers focus on aspects of lived experiences that are often overlooked or unresearched, in order to collect rich details about how participants make meaning of particular experiences (Finlay, 2011).

According to Lopez and Willis (2004), certain key assumptions underpin interpretive phenomenology. The first assumption is that reality is subjective and can change according to the individuals involved. Unlike positivist researchers' rigid search for law-like order, interpretivists are concerned with the individual's understanding of and their reaction to their environment (Benner, 2008; Beuving & de Vries, 2015; Miles , 2018; Yin, 2018). Interpretivists thus assume that individuals experience the same event in a variety of different ways, leading to diverse viewpoints of the same event (Mack, 2010). Heidegger (1962) called this influence of individuals' realities through the world in which they live, their 'lifeworld'. Heidegger (1962) further adopted the use of 'Dasein' ('being-in-the-world'), to describe how individuals' experiences are shaped by their daily living. Individuals cannot remove themselves from the environments that influence their choices and give meaning to them, as these meanings are parts of the whole context (Greene, 2010; Lopez & Willis, 2004).

Freedom, or situated freedom, is the second assumption of interpretive phenomenology. Based on this assumption, individuals have choices, but those choices are to be made within the limits of their contexts, whether social, cultural or political (Heidegger, 1962; Lopez & Willis, 2004).

The last assumption relates to researchers' own lived experiences and contexts (Lopez & Willis, 2004). Often, researchers select topics based on their own experience. During the interpretation process, they also bring their own experience and beliefs to the table, thus co-creating knowledge with the participants. Therefore, whenever researchers make assumptions about the research, they must explain how these assumptions will be used in a study (Constantino, 2008; Greene, 2010; Lopez & Willis, 2004). Berryman (2019) comments that an understanding of the researcher's assumptions regarding truth, the world and existence can be gained through ontology and epistemology.

Ontology refers to how one views reality. The ontological assumptions of interpretivism include the essence of reality and the assumption that reality is subjective, can be altered and is constructed by the individuals involved. From this perspective, there can be multiple realities according to the different individuals involved, and participants

construct meaning through their own intentions, beliefs, values, reasons and self-understanding (Mack, 2010; Mukhles, 2020). It is not seen as irregular for participants to have a variety of different opinions about the same experience (Mack, 2010).

Epistemology can be defined as the process of acquiring information that is known (Grix, 2018). It is the researchers' means of arriving at the knowledge (Hiller, 2016) and their journey of uncovering what is needed to discover reality (Alharahsheh & Pius, 2020). Alharahsheh and Pius (2020) refer to epistemology found within the researcher, emphasising how the researcher discerns right from wrong. Furthermore, the role of the researcher is to make sense of the information, rather than to give reasons for it (Mack, 2010).

The strength of the interpretivist paradigm lies in that the participants are seen as an integral part of their environment instead of objects in reality (Patton, 2015). Interpretivism, as a qualitative paradigm, contributes richness to the data generated with the participants in their specific contexts (Cohen et al., 2018). It allows the researcher to look at the participants' experiences in a comprehensive, well-rounded manner and adds the possibility of unfolding subtle intricacies (Miles, 2018).

A criticism of this paradigm, mostly made by researchers who hold a positivist viewpoint, is that the participants might experience that specific ideas and meanings are being forced onto them. To avoid this perceived feeling of being forced, the researcher is required to maintain a neutral presence and language throughout the research process (Cohen et al., 2018). Another criticism is that interpretive research cannot be generalised due to the more lenient approach to scientific verification procedures. However, the ultimate purpose of an interpretive study is not to generalise the findings. Instead, it is rather to acquire more, as well as detailed knowledge regarding the phenomena within its specific context (Pham, 2018).

3.2.2 Methodological Paradigm

The methodological paradigm for this study was qualitative. Researchers using an interpretivist thought process prefer qualitative approaches when conducting research (Walia, 2015). Walters (2001) states that he believes that there are two major

assumptions in qualitative research. These two assumptions, inductive reasoning and topic specificity distinguish qualitative research. When employing inductive reasoning, researchers first generate the data and then elicit information through analysis. They do not start out looking to prove or disprove a specific theory; instead, they attempt to authentically acquire information from the participants' perspectives (Walters, 2001). Topic specificity, the second assumption, indicates that qualitative studies cannot be generalised but rather that each study is specific to its own phenomena. Qualitative researchers aspire to provide a comprehensive assessment of the particular problem or issue concerned. This is achieved by acknowledging the diverse perspectives of participants, the many different aspects concerned and the variety of angles to be considered (Creswell & Creswell, 2018; Walters, 2001).

Qualitative research involves examining how people construct meaning and experiences in specific settings by exploring challenges and phenomena (Creswell, 2015; Ramsook, 2018). These meanings are observed and inferred through the perceptions or interpretations of individuals or groups. Thereafter, the researcher searches for and presents themes that mirror the participants' views and behaviours (Creswell & Creswell, 2018; Smith et al., 2012).

In qualitative research, meaning is made when phenomena might not be thoroughly observed through quantitative means but rather through the perspectives and contexts of the research participants (Alharahsheh & Pius, 2020; Berryman, 2019). Data are generated through open-ended questions and discussions which are then transcribed and analysed to identify themes and patterns. Other methods used by the qualitative researcher can also include observations, field notes, interviews, documents or recordings. These sources are not limited by fixed instruments but rather allow the participants to contribute their knowledge without constraints (Al Riyami, 2015; Berryman, 2019; Creswell & Creswell, 2018).

The researcher is thus subjectively involved in the research while continuing to stay objective when completing the data analysis (Mack, 2010). In qualitative research, the focus is on the quality and extent of data gathered and discovering the reasons for phenomena by asking specific research questions (Hartell & Bosman, 2016).

Participants' personal accounts and documented conduct are used to gather data and their realities are built on their personal presuppositions, values, perspectives and motives (Nieuwenhuis, 2007; Taylor et al., 2016).

Yin (2016) lists five distinctive features of qualitative research. The first feature is the investigation of meaning in the lives of individuals within their contexts. Qualitative research is not conducted within a confined space, such as a laboratory or workshop. Rather, it is conducted in more natural environments, such as observations, focus groups or interviews. The second feature relates to the leading goal of qualitative studies versus quantitative studies. The focus of qualitative studies is on the viewpoints of a specific study's participants, rather than the researcher's opinions. In other words, the meanings they attribute to the events they experience regularly. Third, contextual circumstances, in other words, their environments (social, corporate and cultural) are considered. The environments wherein individuals exist tend to influence all aspects of their lives. It is crucial to keep in mind that qualitative research should not be seen as a daily journal or diarising daily happenings in individuals' lives. The focus should be on the use of current and new approaches to clarify social conduct and thought patterns. This focus is the fourth distinctive feature of qualitative research. Lastly, multiple sources are used when generating, consolidating and analysing data for qualitative research studies. This enables the researcher to generate richer, more descriptive data.

A strength of this methodological paradigm is that by the researcher focusing on one fundamental concept, a small number of participants are given a voice. This is done through the use of open-ended interviews, deepening the researcher's comprehension of the specific phenomena (Creswell & Creswell Báez, 2020). Another strength is the social aspect of meeting interesting people and hearing their narratives regarding this topic. Using qualitative research can also be seen as being at the forefront of social science methodology (Creswell & Creswell Báez, 2020).

Criticism of qualitative research is that it is accepted that participants' commentary will be subjective, based on their own experiences and values. Researchers who hold a positivist viewpoint usually level these criticisms. Nieuwenhuis (2007) suggests,

however, that these comments are authentic for those people who have experienced them, and that cultivating awareness is a fundamental component of qualitative research (Creswell & Creswell Báez, 2020).

3.2.3 Justification for the Interpretive and Qualitative Paradigms

The researcher chose interpretivism for this study, as the focus was on the phenomenon of teachers' experiences of proprioception and its role in school readiness, as experienced through their own eyes and in their own words. Their diverse viewpoints and in-depth descriptions provided rich data for this study due to their subjective lived experiences of this phenomenon. In the Foundation Phase, teachers are seen as an integral part of their environment instead of objects in reality. The researcher gained a better understanding of the participants' experiences by viewing them within their context and was able to consider their experiences in a much more comprehensive manner and uncover subtle nuances.

Furthermore, a qualitative methodology was selected for this study because of the richness and depth that the researcher expected from the data collected by asking open-ended questions and allowing them to share their experiences and knowledge of proprioception and school readiness. The researcher hoped that this richness would give different perspectives and allow for the expression of multiple viewpoints. The researcher was aware that the research outcomes might be influenced by her own beliefs and value systems. To stay objective, the researcher kept a self-reflective journal and worked with a qualified supervisor. Furthermore, the validity of the research was ensured by following up with participants and ensuring that their comments and responses were correctly captured and interpreted.

3.3 RESEARCH DESIGN

An exploratory case study was used as the research design for this study. When using a case study, the researcher examines a phenomenon in its actual context (Merriam & Tisdell, 2016). Creswell and Creswell (2018) specify that this calls for the investigation of a specific theme within a specific context. Case studies are most appropriate where the questions are intended to clarify a current phenomenon and can include individual participants or groups (Hird, 2003). Furthermore, using case

studies can also provide a comprehensive narrative of a phenomenon. Gerring (2007) suggests that it is more beneficial to have a comprehensive understanding of one case than a limited understanding of a multitude of cases. Case studies present richness and meaningfulness in narration. In addition, analysis and information are combined to contribute to the illustration of various aspects of a specific case (Hitchcock & Hughes, 1995).

Case study research has the advantage of having a distinct realness (Hitchcock & Hughes, 1995). In addition, individual researchers can work on case study research, which reduces the costs associated with organising a team to do the research. Thus, a broader audience can make sense of case study research because it is written in a more commonplace language (Adelman et al., 1976; Nisbet & Watt, 1984).

A unique feature of exploratory case studies is that they are used to probe unknown phenomena, in other words, to explore a new area of study. It can be used as a pilot study to produce research questions for future studies and can result in new theories and concepts (Cohen et al., 2018; Delport & Fouché, 2005; Yin, 2018). Exploratory case studies are advantageous as the researcher can discover new research questions from the data generated (Cohen et al., 2018). Lapadat (2010) raises the concern that using adaptable qualitative methods can lead to exploratory case studies not being theory focused.

A challenge with the aforementioned realness is that systematising the information tends to be complex. The researcher faced a particular challenge by doing self-reflection after the focus group. She also looked for themes and grouped them, in an attempt to get the big picture. Even though the study was written in a more commonplace language, the researcher tried to adhere to the academic style of writing, while making it understandable. Unexpected occurrences and external variables were easier to manage because only one researcher was working on the study. The researcher mitigated the concern of exploratory case studies not being theory-focused by using a conceptual framework and leading theory while compiling the literature review.

The value exploratory case study research had for this particular study is that the researcher investigated the theme of proprioceptive development and school readiness inside the specific context of Foundation Phase teachers' experiences. The distinct realness and commonplace language used in this case study allow for a broader audience to make sense of it, thus providing value to other individuals who can learn from it. To ensure that this study is trustworthy, the researcher confirmed participants' answers where she was uncertain. Moreover, the researcher kept her own bias and judgement in mind, in an attempt to remain objective.

3.4 SELECTION OF PARTICIPANTS

Purposive selection was used in this study. When using purposive selection, the researcher identifies specific features of a certain interest group, specifically individuals who have the knowledge and rich experiences of the phenomenon to be investigated (Creswell & Creswell Báez, 2020; Johnson & Christensen, 2017). Thereafter, the researcher identifies individuals with these specific features.

An advantage of purposive selection is that the researcher can select the most information-rich individuals to contribute to data generation. Disadvantages of purposive selection include that researchers cannot generalise from a sample to the population based on a single research study, and a possible lack of completeness (Johnson & Christensen, 2017; Palys, 2008; Yin, 2016). Information obtained through purposive selection is likely to not be useful for a larger group (Fink, 2015), although it might be used at a later stage in similar studies to make inferences (Lincoln & Guba, 2000).

The researcher chose purposive selection because the study specifically focused on Foundation Phase teachers and their viewpoints on the role of proprioceptive development in school readiness. The age group that these teachers work with is relevant because preschool/Grade R, Grade 1 and Grade 2 teachers are most likely to observe aspects related to school readiness. Therefore, these teachers were deemed to be the most suitable. Six participants were selected from an independent primary school in Pretoria. They were selected based on the following criteria.

- Participants are currently Foundation Phase teachers, specifically Grade R, Grade 1 and Grade 2 teachers. Foundation phase teachers were selected because they specifically work with children in the phase where school readiness is important.

- Participants are aware of the school readiness criteria and how the lack of school readiness skills can affect a child in the Foundation Phase.

The aforementioned participants were thus chosen because of the potentially rich experiences and knowledge that they may have regarding the phenomenon to be studied.

3.5 DATA GENERATION

Data generation enables the researcher to collect information that may shed light on the phenomenon that is being studied (Johnson & Christensen, 2017). Data for this study were generated using a semi-structured focus group and field notes.

3.5.1 Semi-structured Focus Group

For data collection through a semi-structured focus group, a researcher may ask prepared open-ended questions that the participants can answer (Johnson & Christensen, 2017). When using a focus group as a data-generation method, a limited number of participants share their knowledge and experience in a group setting, with the researcher facilitating the process (Johnson & Christensen, 2017). Liamputtong (2015) comments on researchers' opportunities to observe the co-construction of meaning in focus groups as a result of the social context in which they are conducted.

Johnson and Christensen (2017) suggest that researchers should earn the participants' trust, be amicable, display neutral reactions and, most importantly, keep their prejudices in check. Taylor et al. (2016) add that participants will be honest about their emotions and experiences if the researcher tries to accept them as they are and avoids forming preconceived opinions. The researcher, on the other hand, needs to attempt to make sense of the participants' reality. This includes coming to grips with the participants' particular language and terminology and determining the perimeters of the research (Merriam & Tisdell, 2016). A semi-structured focus group provides an

opportunity to gain a rich awareness of the participants' knowledge and experiences (Yin, 2018).

The semi-structured focus group in this study lasted 60 minutes. The semi-structured questions, which were used as a guide during the focus group, are attached in Appendix A of this dissertation. After the researcher analysed the data, she again approached the participants to find out whether they were interested in doing member checking. The purpose of the member-checking session was to determine whether the participants were satisfied that the data was captured correctly. This lasted 30 minutes.

The researcher believes that the participants contributed to the research by sharing their experiences concerning proprioception and its role in school readiness from a practical perspective. The researcher is also of the opinion that the ability to use prompts to get a clearer response or extra clarity about the data enabled her to get richer data for the study.

3.5.2 Field Notes

Leavy (2017, p. 136) defines field notes as "the written or recorded notes of your observations in the field - they are data". Field notes contain that which researchers consider valuable for their specific study, and should be taken down methodically and chronologically (Johnson & Christensen, 2017; Leavy, 2017). Field notes should be of high quality and taken with great attention to detail and meticulously analysed and processed after the data generation process has been completed (Gambold, 2010).

During the focus group session, the researcher made short notes of her observations and thought processes, using keywords and symbols to keep it short but accurate. This allowed the researcher to focus on observing the participants and to stay mindful of her own potential biases. Upon the completion of the focus group, the researcher used these short notes to compile longer, more comprehensive field notes of the data-generation process.

3.6 DATA DOCUMENTATION

This study used audio recording, transcription of the focus group and field notes to document the information gathered during the data collection process.

3.6.1 Audio Data Documentation

During the focus group session, which was conducted via Zoom, an audio recording was made of the proceedings. Using the audio recordings enabled the researcher to focus on the current process of interviewing and on being an active listener, rather than on trying to capture all of the information in notes. The participants' signed consent was needed for the recordings.

3.6.2 Focus Group Transcription

The aforementioned audio recordings were transcribed verbatim and compared to the audio again to ensure their precision. These transcriptions, along with all communication between the researcher and the participants, the audio recording and all written field notes were electronically saved on the researcher's Google drive, as well as on a USB stick in the research supervisor's office which was password protected. This was done to maintain a chain of evidence and to ensure rigour.

3.6.3 Field Notes

The field notes used for this study served as data generation and data documentation tools. Within the context of data documentation, the inclusion of elements such as the date and time of the session, the participant numbers and observations made during the focus group contributed richly to the documentation process (Phillippi & Lauderdale, 2018). Data collection should be preceded by planning for participant protection and this planning should be included in the field notes (Phillippi & Lauderdale, 2018).

In this study, the researcher made field notes in a manner that did not distract her or the participants from the conversation. The participants were described according to their appearance and presence, with a focus on how they conducted themselves non-verbally throughout the focus group. After the session, the researcher reread her

shorthand notes, specifically for each of the questions, and made more comprehensive notes regarding her observations, any changes in the questions and how she asked them. She also reflected on the focus group, making notes of her possible biases, her experience and how she could improve in future data generation sessions.

3.7 DATA ANALYSIS AND INTERPRETATION

The analysis method for this study was inductive thematic analysis, as the researcher wanted to discover themes from the data, rather than attempt to do the research with preconceived ideas (Maree & van der Westhuizen, 2007). Creswell and Creswell (2018) suggest that in an inductive approach, the researcher constructs sequences, groups and themes from simple to more complex concepts. Johnson and Christensen (2017, p. 780) define thematic analysis as the "identification of themes in the research findings". By using this, the researcher worked through the volume of data generated, recognised themes and patterns, and composed a structure to make the final data public. Braun and Clarke (2012) suggest that thematic analysis is an available and responsive flexible method of qualitative data analysis. Table 3.1 describes the six steps the researcher followed during the data analysis process.

Table 3.1: The six steps of thematic data analysis

Step 1: Become familiar with the data	• This step of the process entails looking through all the data before starting with the analysis. The value of this step is that it allows the researcher to get to know the data intimately and to start recognising details that are of importance to the research questions. • Read and reread the transcriptions and watch the recordings of the focus group session. • Make notes during the abovementioned processes and highlight any information that might add value to the research study. • Doing this with focus, while looking at the information in a detailed and critical manner, allows the researcher to start contemplating the meaning of the data.
Step 2: Create beginning codes	• Codes serve the purpose of providing a short description of something that the researcher already understands. • Carefully read through each data item and code that specific item before moving on to coding the next one. • Write down each code, and add it to the data relevant to it.
Step 3: Search for themes	• During this step there is a switch from codes to themes, finding significance within the generated data. • Themes are constructed by re-examining the previously coded data, establishing similarities and overlaps. • Conclude this step of the process by assembling all of the themes and accompanying data in a thematic table or map.
Step 4: Review possible themes	• Compare the themes to the data extracts and analyse whether the theme fits the data. • Once it has been determined that the collection of themes fits the data, determine if the themes make sense across the entire data set by reading through all of the data one more time.
Step 5: Define and designate themes	• Determine what is essential about each theme. • Link the data to the broader research questions. • Decide on straightforward names and descriptions for each of them.

Step 6: Finalising the report	• Final review of the themes.
	• Complete the analysis by linking the themes to the research questions and literature.
	• Member-checking and final review by supervisor.

Source: Braun and Clarke (2012)

An advantage of thematic analysis is that its flexibility allows it to be used in different fields and for different topics. It is also a way in which a beginner researcher can be introduced to research, as it is not as complicated or ambiguous as other methods of analysis (Braun & Clarke, 2012). To avoid forgetting what happened during the data generation process, possible patterns and themes can be noted while the fieldwork is still in process (Patton, 2015). To avoid distractions, Patton (2015) suggests scheduling specific timeslots for analysis and interpretation. This allows for in-depth analysis of the data without distraction.

The researcher started the analysis during the interview period by making notes of any themes that she noticed. The challenge of disorganised or misplaced data was prevented by the researcher ensuring that all interviews, notes, transcriptions and other documents were marked (with a name and date) and backed up. This also prevented data from getting lost in the process. In preparation for the researcher being busy with other activities, a schedule was prepared with specific timeslots for analysis and interpretation. This schedule was sensible and manageable.

3.8 QUALITY CRITERIA

Lincoln and Guba (1985) use the term "trustworthiness" for evaluating the quality of qualitative research. The objective of trustworthiness is to support the argument that an inquiry's conclusions are relevant (Lincoln & Guba, 1985). Rigour in this study was ensured by considering five trustworthiness criteria, namely credibility, transferability, dependability, confirmability and authenticity.

3.8.1 Credibility

Credibility is how internal validity is judged in qualitative research. It is established when the participants recognise the experiences defined in the final product (Hammarberg et al., 2016). In a qualitative study, participants' original data and a correct interpretation of it should be accurately reported as research findings. Participants should be allowed to assess and approve a summary of the focus group session (Greeff, 2005; Ivankova, 2014) and member checking should be done to ensure that the recorded data accurately represents the participants' views (Lincoln & Guba, 1985).

The researcher aimed to preserve the research's credibility by continuous self-reflection to prevent bias. Triangulation and detailed notes were used to ensure that the analysis was truthful concerning the data generated. A comprehensive summary of the focus group session was given to participants for their approval. To guarantee that the recorded data was precise and an accurate representation of the participants' perspectives, member checking was done.

3.8.2 Transferability

Jensen (2008) defines transferability as the possibility of a specific research study's results being carried over to different contexts outside of the specific study. Qualitative research studies might not be transferable or generalisable, therefore, the researcher needs to ensure the theoretical parameters of the research for future researchers to determine whether it is relevant to their context (Lincoln & Guba, 1985). When readers of a research document can relate to the information in the document, the researcher has achieved transferability (Tracy, 2010). In this study, the researcher defined the theoretical parameters of the research by specifying the criteria for participant selection. Furthermore, purposeful selection was used to select participants to reinforce the transferability of this study. The participants selected accurately represented the boundaries and constraints of the study and the research design. This will enable future researchers to determine if the research is relevant to their context.

3.8.3 Dependability

Dependability refers to the consistency or reliability of findings (Prosek & Gibson, 2021). In other words, if external researchers analyse the data, will they be able to similarly interpret it? (Nassaji, 2020). It can be managed by accurately recording every part of the process (Nassaji, 2020). These procedures will allow other researchers to repeat the process, using the detailed methodology, and produce comparable results (Chowdhury, 2015). Dependability in this study was ensured by the researcher keeping a detailed record of the procedures and self-reflecting on the steps.

3.8.4 Confirmability

Behar-Horenstein (2018) defines confirmability as how believable a specific research study's result is. Lincoln and Guba (1985) emphasise that external researchers should be able to validate the findings using only the data. In this manner, the subjectivity of the researcher is removed, and only the data is examined. Furthermore, an audit trail should be provided (Lincoln & Guba, 1982).

To ensure confirmability in this study, member checking was used to authenticate the participants' perspectives of the data. The researcher ensured that she had a clear audit trail by storing the audio recording of the focus group, all of the documents and her field notes in an encrypted format on her computer. She kept track of the analysis process by taking screenshots of her steps and employed regular self-reflection, written in her self-reflective journal, to determine where she might be biased and where she might improve.

3.8.5 Authenticity

Authenticity, according to James (2008), is the researcher's certainty that the research is legitimate in both the context of the participants and in wider contexts, like society in general. Thus, authenticity is whether the research is beneficial to society. In other words, it addresses context. Guba and Lincoln (1989; 2005) note five points that reinforce authenticity. These are fairness (asking questions that search deeper than the obvious), ontological and educative authenticity (assisting the participants in making sense of what is being studied, as well as the viewpoints of others), and, lastly,

catalytic and tactical authenticity. When the participants have taken a form of action, it is catalytic authenticity. When the participants feel like they can bring about change in their communities, it is tactical authenticity.

To ensure authenticity in this study, respondents gave their full informed consent, and the researcher was mindful of building a trusting relationship with all the participants. Guidelines regarding confidentiality, within the focus group setting, were negotiated at the beginning of the focus group, and participants all had the opportunity to agree or disagree on these guidelines. Furthermore, all participants had the opportunity to participate in a member-checking session after the data had been analysed.

3.9 ETHICAL CONSIDERATIONS

Attitudes and behaviours may be influenced by values such as equality, respect and dignity. They provide the basis for the principles implemented in our daily lives and research. As a result, we are motivated to act by our values but constrained in what we can do by ethics, thus recognising that not everyone has the same values. Respecting the values of others is an ethical requirement (Iphofen & Tolich, 2018). In the end, ethics are essential because it helps us stay committed to our values (Johnson & Christensen, 2017). There were a few ethical considerations pertinent to this study, namely informed consent and voluntary participation, privacy, confidentiality and anonymity and conflict of interests.

3.9.1 Permission, Informed Consent, and Voluntary Participation

Informed consent involves the education of stakeholders and participants regarding the goal of the research, the process to be followed, any dangers and advantages and the confidentiality boundaries before agreeing to be a part of the research study. Before starting with the data-generation process, all the participants need to be informed of the above, as well as alternative procedures, confidentiality challenges and limitations in the focus group context (Johnson & Christensen, 2017). All stakeholders and participants also need to be made aware that participation in the data generation process is participatory. Voluntary participation is the participant's right to participate of their own free will and to drop out of the research study, at any time,

without any repercussions (Johnson & Christensen, 2017). Direct or indirect coercion is unethical and should be avoided (du Plessis, 2016).

For the purpose of this study, the researcher communicated with a teacher at a private primary school who presented the request to the school management. Thereafter, the teachers were invited to participate in an online information session and focus group session, and a formal letter was sent to the principal requesting permission to conduct research at his school. During the information session, the researcher provided the participants with all the relevant information regarding the research project, and they had the opportunity to ask questions. They were given an informed consent letter by the contact person after this session. This letter detailed the relevant information about the research. After a brief explanation of all of the aspects concerning the data-generation process, the participants had the opportunity to sign the informed consent form or excuse themselves from the focus group. The participants were made aware of their right to voluntarily participate. They also had the opportunity to excuse themselves from the focus group discussion before the interview commenced.

3.9.2 Privacy, Confidentiality and Anonymity

Privacy, confidentiality and anonymity entail that the participants' identities are not released at any time. By allocating a number to each participant during the transcription process, order and structure were maintained. Aliases can also be used to protect the identity of identifiable individuals. Participants should be treated as esteemed partners in the data generation process (du Plessis, 2016; Leavy, 2017; Liamputtong, 2015).

For the structural and orderly recording of the transcriptions, each participant received a number. These numbers were used during the data generation and analysis processes. In situations where participants discussed children, aliases were given as a means of protecting their identities. Because interviews were done in a focus group, the researcher could not guarantee the complete privacy, confidentiality and anonymity of participants. What the researcher did, however, was to navigate a set of ground rules, including a request that all participants would respect the information given by their fellow participants.

3.9.3 Respect, Integrity and Truthfulness

Respect for participants is shown in the recognition of their inherent worth, dignity and value perception. It is through respect, integrity and truthfulness that participants can be treated in a fair and equal manner and their best interests are considered when decisions are made (Health Professions Council of South Africa [HPCSA], 2022). Furthermore, the researcher should be polite and considerate when generating data. This can be done by actively and respectfully listening to the participants and honouring their viewpoints (HPCSA, 2016). The basis of trust between healthcare practitioners and their research participants is truth and truthfulness. Therefore, ethical practices should serve as the bedrock of all research (HPCSA, 2021).

The researcher's integrity is compromised when there is payment for the research conducted or when the researcher has an absolute investment in the results of the research. The researcher should submit any information pointing to these possible conflicts of interest (Creswell & Creswell, 2018). There were no conflicts of interest in this research study.

3.10 CONCLUSION

This chapter described the methodology used to explore Foundation Phase teachers' viewpoints on the role of proprioceptive development in school readiness. Furthermore, the research design, processes used to control the quality of the study, and ethics considered during the research process were also discussed.

CHAPTER 4: FINDINGS OF THE STUDY

4.1 INTRODUCTION

The findings of the study are presented in this chapter in three main themes and nine sub-themes. The first theme presents the findings on Foundation Phase teachers' knowledge of school readiness and proprioception and the role proprioception plays in school readiness. Theme 2 presents the findings on the opportunities they have in their classrooms to facilitate proprioceptive development, the strategies they use to develop or enhance proprioception and the challenges they experience when it comes to facilitating activities for proprioceptive stimulation in the classroom. Theme 3 presents the findings on teacher training and development, opportunities for future growth and their knowledge of professional support available to struggling children. As a guide, Table 4.1 below provides an overview of the three broad themes and their related sub-themes.

Table 4.1: Overview of themes and sub-themes

THEMES	SUB-THEMES
Theme 1: Knowledge of school readiness and proprioception	Sub-theme 1.1: School readiness
	Sub-theme 1.2: Proprioception
	Sub-theme 1.3: The role proprioception plays in school readiness
Theme 2: Facilitation of proprioceptive development	Sub-theme 2.1: Activities that facilitate proprioceptive development
	Sub-theme 2.2: The classroom as a space to facilitate proprioceptive development
	Sub-theme 2.3: Challenges in facilitating activities that develop or stimulate proprioception

| Theme 3: Teacher training and development | Sub-theme 3.1: Teachers' preparedness |
| | Sub-theme 3.2: Future training needs |

In the following section, the results of the study will be presented. The chapter concludes with a discussion of the findings within the context of the literature.

4.2 RESULTS OF THE STUDY

This section presents results under the various themes and sub-themes as outlined above that emerged from the data. To support the results, the inclusion criteria and excerpts from the data sources are provided for the themes and sub-themes.

4.2.1 Theme 1: Knowledge of School Readiness and Proprioception

The focus group interview commenced with an understanding of the participants' knowledge of school readiness and proprioception. For this study, knowledge refers to the facts, information and skills the participants have acquired, whether theoretical or practical, through education and/or experience. The above working definition was used to identify the sub-themes related to the theme of knowledge. This section discusses the three sub-themes of Theme 1, presenting data that relate to the participants' knowledge of school readiness and proprioception, respectively, and their views on the role proprioceptive development play in school readiness.

4.2.1.1 Sub-theme 1.1: Knowledge of school readiness

Table 4.2 provides a working definition of school readiness and the inclusion criteria that were used for sub-theme 1.1.

Table 4.2: Working definition and inclusion criteria for sub-theme 1.1

WORKING DEFINITION: Knowledge of school readiness
For the purpose of this study, school readiness is defined as the physical, socio-emotional and cognitive skills children need to master to succeed academically and socially in a challenging, formally structured classroom environment (Bender et al., 2011; Chandra, 2017; Janse van Rensburg & Erasmus, 2016; Joshi et al., 2019; Millians, 2011; van Zyl, 2011).
INCLUSION CRITERIA
Words that guided the inclusion of data were "able to", "need to", "can", "cannot", and references made to physical, emotional, social and cognitive activities and behaviours.

The participants had a clear understanding of what school readiness is. They acknowledged that a variety of factors needed to be considered, including social, emotional and spiritual development. Participant 5 was of the view that academic and spiritual readiness should be considered before a child can be regarded as ready for school. The following excerpt evidenced her view:

> *So, children need to be socially ready to go to big school. They also need to be emotionally ready. They need, obviously need their skills, they need to be ready. And then also academically and spiritually. I think one has to consider all those things before a child can go to big school[3] (P5, L8-11).[4]*

The researcher asked the participants how they knew that children were ready for formal learning. One participant mentioned that it would be easier to explain what to look for when a child is not ready. The participants then proceeded to comment on immature behaviours such as a tendency to cry, tantrums and outbursts as indicators

---

[3] Data are quoted verbatim with light editing to ensure that the authenticity of the participants' views are not lost but that understanding is ensured.
[4] After every quote, in brackets, the letter "P" followed by a number indicates which participant expressed the response. After the comma, the letter "L" followed by a number range indicates the line reference as presented in the transcription of the focus group (refer to Appendix E).

of not being ready. A lack of responsibility and self-confidence were also mentioned, as well as a dependence on their parents. Furthermore, the participants commented that emotionally immature children tend to find separation from their parents and accepting other authority figures challenging.

> *I think it is easier to say what you should look for to show he is not socially ready (P5, L16-17).*

> *They back down from challenges. They do not want to try. Rather, they hide in a corner (P5, L39-40) (also see P5, L21-24).*

> *Well, I just think the kids who still throw terrible tantrums that they want their thing on their time as they want. That 'own self' is still incredibly important to them (P5, L19-21) (also see P3, L26; P3, L29 and P5, L39).[5]*

> *That separation anxiety. They are still struggling with it (P1, L43) (also see P6, L27 and P3, L29).*

Participant 4 added that the child's date of birth may also be a strong indicator of emotional readiness for school. She stated the following:

> *Then we have children who have birthdays very late in the year. We also have to see if they are emotionally ready to go to school. Will they be able to handle the pressure of Grade 1, for example? So, we look at separation anxiety. Emotionally, are they teary in class? Do they want to do chores? That type of thing (P4, L33-37).*

Among indicators that children are not academically ready, the participants mentioned delays in vocabulary and struggling to identify and count numbers on an abstract level. They also mentioned that children should be able to write their names. The following quote illustrates this:

---

[5] For brevity, I present the best samples of data that illustrate the results that emerged and thereafter provide additional line references to data samples which support the results (refer to Appendix E).

Delays. The vocabulary is missing. They cannot count. They struggle to identify with numbers or with objects they cannot experience concretely (P5, L46-47) (also see P6, L6).

Lastly, Participant 4 identified planning skills, motor skills, muscle tone and other delays as indicators for school readiness:

Planning skills. It just depends. Big motor, fine motor, planning skills, low muscle tone and how far the child is behind the friends going to school (P4, 49-51).

The findings on the participants' knowledge of proprioception are discussed next in sub-theme 1.2.

4.2.1.2 Sub-theme 1.2: Knowledge of proprioception

Table 4.3 provides a working definition of proprioception and the inclusion criteria that were used for sub-theme 1.2.

Table 4.3: Working definition and inclusion criteria for sub-theme 1.2

WORKING DEFINITION: Knowledge of proprioception
Proprioception is the body's internal recognition and processing of signals from mechanoreceptors that enable children to know exactly where their limbs are in relation to their own body, as well as the space around them and how much force to use when manipulating objects (Benn, 2017; Han et al., 2016; Hayton, 2017). Knowledge of proprioception refers to the facts, information and viewpoints concerning proprioception acquired by the participants through education and/or experience.
INCLUSION CRITERIA
Words that guided the inclusion of data were "body in space", "position" and "perception".

The focus group discussion progressed from the participants' knowledge about school readiness to their knowledge about proprioception. This transition was facilitated when the researcher asked the participants for a definition of proprioception. They

responded by laughing. When the researcher prompted further by asking the participants if they had heard of proprioception, five nodded. Following this, three of the participants gave their definitions of proprioception. The participants had a vague idea that it has something to do with the body and how individuals experience the world, as well as the messages that the limbs send to the brain. None of the participants seemed confident about how to define proprioception, and Participant 6 quickly added that her definition was not a textbook definition. Their responses were as follows:

> *Is it not something about how you experience your body in the world? Something like that? (P4, L115).*

> *It is your perception of what's around you – where your body stands in the world (P3, L117-118).*

> *It has to do with position in space, but it is the messages that your limbs send to your brain and the experience of it (P6, L121 & 123). But that is not the textbook's definition (P6, L125).*

The researcher offered her definition of proprioception to the participants to consider by stating that it is the body's perception of where it is in space and that it influences how children develop their 'body map'. Children's drawings indicate their body maps and proprioceptive development. The researcher further explained that individuals need to know where they are in space before they can compare themselves to other objects and before they can compare other objects to each other, which can be seen in how adults can put a spoon into their mouth without having to look at it. However, when toddlers start learning to feed themselves, food tends to end up all over the floor. When the researcher asked the participants if they agreed with her understanding of what proprioception is, they nodded their heads in confirmation but made no further comments.

The findings from the participants' views regarding the role that proprioceptive development plays in school readiness are discussed next in sub-theme 1.3.

4.2.1.3 Sub-theme 1.3: Knowledge of the role proprioception plays in school readiness

Table 4.4 provides a working definition for the construct of playing a role and the inclusion criteria that were used for sub-theme 1.3.

Table 4.4: Working definition and inclusion criteria for sub-theme 1.3

WORKING DEFINITION: The role of proprioception in school readiness
According to the MacMillan dictionary, playing a role means being involved in something, particularly in a significant way (MacMillan Dictionary, n.d.). The role of proprioception in school readiness means proprioceptive development's role in the physical, socio-emotional and cognitive skills and behaviours that are expected and experienced in a formal classroom environment and are perceived by the participants to be supported by proprioceptive development.
INCLUSION CRITERIA
Words that guided the inclusion of data were "important", "interact", "interconnected", "linked", "helps" and "have an effect on".

When the researcher asked if proprioceptive development plays a role in school readiness, the participants responded that it was very important and influenced mathematics and language, as well as social interactions. They emphasised that all of the aspects are interconnected. They said the following:

> Yes, I think it is very important. I think it helps with math, with language ... I definitely think there is a big influence in those areas. And also, how the child interacts with his friends because if you know your place and do not know who you are, it is much more difficult for them to interact with other friends. I mean ... it is very important (P3, L151-155) (also see P6, L165).

> Yes, I think it is something that has an effect on everything else. So, it is going to have a ripple effect because if your proprioceptive development is not sufficient in that way, then you are going to struggle with more things going forward. So, it is something that one would actually want to identify in preschool to address if you see there are problems (P6, L157-160) (also see P6, L702; P1, L719-721; P6, L167-L168 and P4, L269).

The researcher further prompted the participants on their thoughts regarding the effect of proprioceptive development on children's relationships with their peers. The participants gave varying answers, ranging from self-esteem to personal space:

Maybe self-esteem? That you do not see yourself as the same age as your friends. Perhaps you see yourself differently from the rest of the class (P3, L197-198).

Could it affect how hard and how soft you touch another child? It is not a good measure now, because usually they are playing 'touchers' on the field. They bump into each other and then accidentally just touch and then there is a whole altercation as a result (P6, L199-204).

It is about personal space too (P1, L206).

The researcher asked the participants their thoughts on how proprioception influenced academic abilities specifically, starting with mathematics. The participants mentioned symmetry, shapes, number lines and days of the week sequences as skills required for readiness in mathematics. They stated the following:

I think shapes in space. Symmetry, I think a lot. Three-dimensional shapes. I see how you can struggle with knowing how to distinguish the shape. How to spot symmetry. Yes, it comes down to shapes a lot. And also, because it has an effect on midline crossing, so it comes back to those numbers that they reverse (P3, L232-235) (also see P1, L228; P6, L236-237 and P4, L264-267).

We have a 'days of the week' nursery rhyme that we say every day (P4, L303).

And then they still do not know (P6, L305) (also see P4, L307-308; P4, L 301 and P4, L 315-317).

Unless they rather struggle with the calendar with the application of it? (P3, L309) (also see P3, L 311-312 and P4, L313).

They then mentioned language, specifically reading and writing skills:

> *Any reversals with letters (P3, L244).*

> *Well, his letters fly around or are below the line or are halfway. We always say: 'Let it sit on the line', but it is very difficult for them to understand that (P1, L252-253) (also see P1, L245 and P3, L246).*

> *I think reading direction. Same with writing direction. Do they know what is left, and right? And where it starts like prepositions (P4, L260-261).*

> *It can also be your sequence of letters just like it is with numbers. Also, what do you hear first, what do you hear in the middle? To hear it and to write it (P1, L271-272) (also see P3, L274; P3, L277-280; P4, L687-688 and P3, L689; and P3, L691).*

> *Maybe in your language development (P3, L684) (also see P4, L685; P3, L686).*

The researcher prompted them to also give their views on speech and pronunciation. The participants seemed uncertain but mentioned the placement of the tongue, the muscles in the mouth and the volume of the speech:

> *...because the placement of your tongue determines how you pronounce things. So, it could perhaps play a role. (P6, L697-698) (also see P1, L700).*

> *And … how loud and soft you speak (P3, L701).*

Next, the researcher asked the participants about their views regarding proprioceptive development in academic and motor planning. The participants commented on executive skills such as organising, following directions and planning. They stated the following:

> *Will it also be instructions, to remember order of instructions? First, I have to do this. Then I have to do that, and then I have to do that (P1, L291-292).*

> *I think it plays a role if you want to get into the planning. Like which way your little hand should go and how you have your skills of how you have to hold your little hand. It is also fine motor but a lot of it has to do with the planning. First*

the big shapes and then the small shapes. I think this is where it plays a role (P5, L420-423) (also see P6, L286-289 and P5, L499-500).

I personally think it varies. Um, it depends how the child cuts. Is it like, he cannot distinguish between foreground and background and maybe from the circle to this weird shape ... And whether it is just that his scissor and fine motor skills are not quite up to standard, shoulder stability (P4, L414-417) (also see P6, L403-406 and P5, L420-423).

It is that uncertainty of a little body that does not know. The children are completely lost and I think anxious. Also, anxiety leads to them needing a lot more reassurance because they struggle to know how a day will proceed. They need that extra security because the planning is so difficult for them (P5, L490-499).

The participants commented that children may present with concentration difficulties as a result of difficulties with body awareness. The following statement is evidence of this:

I think the children get frustrated with themselves because they cannot do it, then they do not concentrate. They would rather look at what the other children are doing, for example. It feels to us like they have concentration problems, but actually they do not know where to apply their bodies (P4, L393 and L395-398) (also see P1, L401).

It was clear from the discussion that the participants had a better understanding of school readiness than of proprioception and its role in school readiness. Even though the researcher noted that the participants could see the importance of proprioception and its role in school readiness, she also noted that the participants seemed uncertain about their answers. The researcher asked them to elaborate and prompted the discussion numerous times. During the discussion on proprioception and planning, Participant 1 mentioned that they encourage the parents to allow children to be independent. As such, the conversation moved to the opportunities and challenges regarding proprioceptive development in the classroom, which will be discussed in the next section under Theme 2.

4.2.2 Theme 2: Facilitation of Proprioceptive Development

This theme represents the participants' views regarding the facilitation of proprioceptive development in the classroom. For the purpose of this study, facilitation refers to the maturation, advancement and improvement of proprioception. The above working definition was used to identify the sub-themes related to the theme of facilitation. Based on the data, three sub-themes were identified for Theme 2. Each sub-theme discusses the facilitation of proprioceptive development as identified by the participants and focuses on the activities, opportunities and challenges, respectively.

4.2.2.1 Sub-theme 2.1: Activities that facilitate proprioceptive development

Table 4.5 provides a working definition of the activities that facilitate proprioceptive development and the inclusion criteria that were used for sub-theme 2.1.

Table 4.5: Working definition and inclusion criteria for sub-theme 2.1

WORKING DEFINITION: Activities that facilitate proprioceptive development
Activities that facilitate proprioceptive development mean planned movement, rhythm, poems and songs between formal learning sessions that give children the structure to fidget and move around and stimulate their proprioceptive system. The movements can be fast, rhythmic stimulation that affects children's arousal levels and alertness, or slow, rhythmic stimulation that calms them (Kranowitz, 2005; Recoder, 2019; Saunders, 2005).
INCLUSION CRITERIA
Any reference made to proprioception-enhancing activities that participants implement during their lessons. Words that guided the inclusion of data were any words that alluded to movement such as "dance", "jump" and "run".

After discussing the role of proprioceptive development in school readiness, the researcher asked the participants if they could identify classroom activities they used that facilitate proprioceptive development. The participants mentioned physical activities such as dancing, Brain Gym® exercises, horse riding and using their senses to experience their bodies. Furthermore, they also use foam blocks to create obstacle

courses which the children have to navigate and use to develop their body in space awareness. They stated the following:

I let them dance. Not every day but do 'Go Noodle' dances. I put a video on for five minutes for them to just dance a little bit. They get their muscles going a bit (P2, L521-530) (also see P6, L554-557).

I also think Brain Gym® exercises (P3, L531) (also see P2, L532; P3, L533-534; P3, L536-537 and P3, L539-540).

Horse riding is also a big one. We have horse riding people who come once a week with horses ... then the children will be on the horse and get instruction, like 'turn around' and 'upside down' (P4, L548-551) (also see P6, L547).

I feel that at preschool we have a lot of goodies that we implement there. We use our senses to experience our bodies and what we see in the environment (P4, L543-545) (also see P4, L553).

There are large foam blocks to sometimes build obstacle courses and stand in the front and behind. In class, we do that a lot (P4, L545-546).

The participants also emphasised that the children need movement activities that can be done quickly between lessons because they have to sit still and concentrate for extended periods. They mentioned the following:

My personal opinion, as a mom is that it is incredibly important to bring this type of stuff in between activities because those little bodies sit and concentrate for three hours a day (P5, L581- 593) (also see P5, 585-586).

The children are still small. So, our children can go for a quick walk around the sand pit, to hop around, to balance, airplane arms. Even if we just change stations, I let them hold their toes when they walk. Just to take that concentration break ... I think it is really important (P5, L588-592) (also see P6, L594-597).

After this comment, the researcher felt that it was a good time to ask the participants about the suitability of the Foundation Phase classrooms for proprioceptive learning activities. Their views on this will be presented below in the next sub-theme.

4.2.2.2 Sub-theme 2.2: The classroom as a space to facilitate proprioceptive development

Table 4.6 provides a working definition of the classroom as a space to facilitate proprioceptive development and the inclusion criteria that were used for sub-theme 2.2.

Table 4.6: Working definition and inclusion criteria for sub-theme 2.2

WORKING DEFINITION: The classroom as a space to facilitate proprioceptive development
The classroom as a space to facilitate proprioceptive development means the availability of equipment and structures inside and outside the classroom that allow for activities to support the development of the child's proprioceptive system. These structures allow ample opportunities for the children to engage in large, physical movements (Akbar, 2020; Case-Smith, 2010; Kaviraja, 2021; Kranowitz, 2005; Recoder, 2019; Vaishnavi, 2021).
INCLUSION CRITERIA
Any reference made by the participants to equipment and structures available to them in and around the classroom.

After the researcher asked the participants about the suitability of their classrooms for proprioceptive activities, the participants initially mentioned that they did not think the classroom space was a suitable space to allow for these types of activities. However, as they started sharing ideas, they realised that they could use existing classroom equipment such as trampolines, Pilates balls and balance beams. The discussion seemed to lead to the participants changing their minds about the suitability of the classroom. They said the following:

> I do not think the classroom is physically set up like that. I think you really need to have a mind shift if you want to exercise in class between your activities. (P3, L564-565)

Yes, we are privileged in the sense that every class has a small, mini trampoline. Every now and then, if we do a specific lesson or an activity, then each guy has to jump three times and, and go on like that (P6, L573-575) (also see P3, L567-569 and P4, L572).

Yes, we also have Pilates balls, for example, to ground … them (P4, L570).

You can probably also put a balance beam outside and … you have to walk on a balance beam when you are done with something (P3, L576-577).

Yes, I think there are many possibilities (P3, L579).

Participant 6 also mentioned that they used to teach concepts on the mat and in small groups, which allowed for movement when the children swapped places. At the time of the data generation, however, they were not allowed to use the small group format due to the COVID-19 preventative measures.

And then, in the past, now not at the moment, because we have to be so far apart, then they were on the carpet a lot. Especially still in Grade 1. We teach many of our concepts in a small group format, so we would have five to six children in front of us and the rest go on with another activity. So, we always had a group that swaps, which is also a nice physical movement for them in the class (P6, L597-600).

4.2.2.3 Sub-theme 2.3: Challenges in facilitating activities that develop or stimulate proprioception

Table 4.7 provides a working definition of challenges in facilitating activities that develop or stimulate proprioception and the inclusion criteria that were used for sub-theme 2.3.

Table 4.7: Working definition and inclusion criteria for sub-theme 2.3

WORKING DEFINITION: Challenges in facilitating activities that develop or stimulate proprioception
The Cambridge dictionary defines a challenge as anything that requires great mental or physical effort to be completed and which tests an individual's abilities (Cambridge University Press, n.d.). Challenges in facilitating activities that develop or stimulate proprioception mean anything that stands in the way of the child participating in or the participatory teachers implementing proprioceptive enhancing activities.
INCLUSION CRITERIA
All data related to challenges mentioned by the participants. Words that guided the inclusion of data were "Covid", "struggle", "time" and "pressure".

Based on Participant 6's experience of how Covid-19 affected classroom activities, the researcher explored this further with the participants. The participants indicated that COVID-19 preventative measures also led to challenges in allowing activities that could potentially enhance proprioceptive development. Challenges mentioned by the participants included a lack of outdoor activities and a lack of human touch. Their responses were as follows:

> *Specifically, nowadays with COVID, the children are not doing a lot of outdoor activities and sport. Things are cancelled. And I think a lot of them are very delayed in their gross motor skills. A lot of them (P2, L519-521).*

> *I want to say we are all human. We need touch. So, we are really struggling. Especially with the little ones, it is terribly difficult to do social distancing. When we stand in line, they hang on to each other. So, we have, we need touch. We are people. So, they, they really miss out on that, yeah. Yes, I think it does affect their behaviour (P4, L610-614).*

When the researcher asked the participants what they noticed in the children' behaviours, they commented that the full effects were probably delayed and might only become evident in the future. Furthermore, the participants mentioned that the inability to express themselves due to the masks and growing anxiety levels may have

implications for the children in future and that the full effect of this may only be visible later on. The following excerpts evidence their views:

> *Feel like they cannot necessarily express themselves. I mean sitting in class all day with your little mask on and you do not really know what is wrong, but you are annoyed (P3, L617-619) (also see P4, L616).*

> *I feel that their whole life has changed, and that anxiety takes away their confidence, so it is hard to say which of this is really school readiness necessarily and which of it is your confidence and your security, of 'I am going to be okay'. Yes, it is a difficult time. For the children. Also, for us (P5, L622-625) (also see P5, L620).*

> *I do not that think we are seeing the big picture just yet. But, in a year's time, when those Grade 1s are in Grade 3, we might see a different picture (P6, L627-629) (also see P6, L631-636 and P1, L638-644).*

Another challenge mentioned by two of the participants was a lack of time to implement proprioceptive activities:

> *And I just feel like it is time-consuming. I understand that and we all have pressure (P5, L583-584) (also see P3, 579-580 and P3, L655).*

To better understand the participants' views on the role of proprioceptive development in school readiness, the researcher explored their training and how they developed their current perceptions. The participants also mentioned areas in which they felt they lacked knowledge and needed further training. These topics will be discussed in the next section under Theme 3.

4.2.3 Theme 3: Teacher Training and Development

For the purpose of this study, training and development are defined as teachers' level of education, professional development activities and in-service training that equip them to facilitate proprioceptive development and school readiness (Ajani, 2019; Taylor, 2019). Theme 3 focuses on teacher preparedness, future training needs and teacher knowledge of professional support, respectively.

4.2.3.1 Sub-theme 3.1: Teacher preparedness

Table 4.8 provides a working definition of preparedness and the inclusion criteria that were used for sub-theme 3.1.

Table 4.8: Working definition and inclusion criteria for sub-theme 3.1

WORKING DEFINITION: Teacher preparedness
The Oxford Learner's Dictionary defines preparedness as being willing or ready to act (Oxford Learner's Dictionaries, n.d.). Teacher preparedness thus refers to teachers' knowledge and experience that enables them to be willing and ready to identify and enhance school readiness skills and proprioceptive development.
INCLUSION CRITERIA
All data related to training and experience mentioned by the participants. Words that guided the inclusion of data were "experience", "qualifications", "courses", "know" and "learn".

Closely related to the participants' knowledge of school readiness and proprioception is how they were trained and what their future training needs may be. When asked where they obtained their knowledge and skills about school readiness, the participants mentioned their undergraduate education. They stated the following:

> *I do not necessarily think it is in the four-year degree (P3, L85-86).*

> *It was a long time ago. OPV must have touched on it. You have learnt the principles after all (P6, L88-89) (also see P3, L87).*

> *You learn about the social, emotional, physical development. But you only learn when you are in practice. No one told you how to assess a child (P4, L90-92).*

The participants were of the view that they have gained more knowledge regarding school readiness from in-service training, including getting to know the curriculum, professional development in the form of reading and attending workshops and also their post-graduate education. Their responses were as follows:

You just learn, with teaching ... you just swim in the sea (P4, L92-93).

And you know what the children have to do. You go on experience what you are going on. We also do school readiness tests. So, we know more or less what end goal we are working towards (P4, L69-71) (also see P5, L445-446; P5, L448 and L453-454).

You know your curriculum (P4, L67) (also see P4, L443-444).

I read (P1, L73).

I think it depends on what courses one has done (P3, L82).

I studied educational psychology, so I also did those tests and did evaluations and so on (P3, L84-85).

The participants seemed to have had very little training regarding proprioception. Only one participant mentioned that she first heard it mentioned by her child's occupational therapist. None of the other participants mentioned where they had learnt about it. They further stated that they felt this research did not exist when they were undergraduate students and, therefore, they were not knowledgeable about proprioception and what it affects. The following excerpt evidenced their views:

Or that is where I first heard about it was from my child's occupational therapist (P6, L161-162).

This research did not all exist 20 years ago. (P6, L673)

4.2.3.2 Sub-theme 3.2: Future training needs

Table 4.9 provides a working definition of training needs and the inclusion criteria that were used for sub-theme 3.2.

Table 4.9: Working definition and inclusion criteria for sub-theme 3.2

WORKING DEFINITION: Training needs
Training needs are needs that result because of a lack of or desire for professional development activities that are meant to improve teachers' professional competence, making them prouder of their profession and more effective teachers (South African Council for Educators, 2012).
INCLUSION CRITERIA
All data related to training needs mentioned by the participants. Words/phrases that guided the inclusion of data were "I do not know", "teacher cannot", "introduce", "inform" and "practical".

One participant was of the view that teachers were unable to solve the challenges with children's proprioceptive development because they did not have sufficient practical exposure in their training on how to support children. This suggests the need for further professional development. The following quotes illustrate this:

> *It is something that needs to be introduced or we need to be informed about it. Practical stuff. Then you get physical exercises, which you have to do in class every day (P6, L675-676 & 678) (also see P6, L671-672).*

> *I think that if the teacher in the class cannot necessarily solve it... and we refer the child to an occupational therapist, for example, I feel there should be faster results. It feels to me like it takes too long. Sometimes, after two or three years, the child struggles with the same things. And then what? (P3, L654-659) (also see P3, L663-664).*

> *I do not know where one can integrate more and where one can do more (P3, L669-670) (also see P2, L380-384).*

The next section summarises the findings of the study with the reviewed literature, based on individual themes and sub-themes.

4.3 PRESENTING THE FINDINGS OF THE STUDY WITHIN THE CONTEXT OF LITERATURE

The participants were of the view that various factors, including social, emotional, spiritual and academic development, had to be considered for children to be ready for school. Crying, tantrums, emotional outbursts, a lack of responsibility and low self-confidence were identified as some of the emotional and behavioural indicators that children were not ready for school. Separation anxiety and recognising emotions and regulating them were also noted as indicators. The participants' descriptions of immature emotional behaviour resonate with the research that emotional readiness heavily influences academic achievement and classroom participation (Hamerslag et al., 2018; Harrington et al., 2020; Widyaning et al., 2019).

The participants indicated that chronological age might be a marker for emotional readiness. They commented on the time of year when children were born and suggested that children who were born later in the year had to be monitored to determine if they were able to cope with the pressures of Grade 1. Various studies have examined children's chronological age as an indicator of school readiness, supporting the participants' suggestion to monitor children born later in the year (Gullo, 2018; Miller & Kehl, 2019; Retnawati et al.,2021).

On an academic level, the participants mentioned vocabulary delays and the ability to identify and count numbers on an abstract level as indicators of not being ready for school. The ability to write their names was mentioned as a necessity. In line with the literature, these skills are domain-specific and necessary for academic success (Burchinal et al., 2020; Kokkalia et al., 2019; Turnbull et al., 2022). According to Turnbull et al. (2022), planning is a domain-general cognitive ability which the participants described as a prerequisite for children to thrive in formal academic environments. In addition, they mentioned that motor skills and muscle tone are important skills for academic readiness. Various studies have reported on the importance of gross and fine motor skills and how these skills are important for children's ability to participate smoothly and safely in classroom activities and maintain postural control to learn (Burchinal et al., 2020; Kokkalia et al., 2019; Turnbull et al.,

2022) while Gligorovic et al. (2011) stated that children's balance and their ability to copy shapes accurately are strongly correlated since postural control ensures that the head, eyes and limbs can move accurately.

The participants were unable to provide a clear definition of proprioception. However, they had a vague idea that it relates to the body in space, how individuals experience the world and the messages the limbs send to the brain. In addition, the participants in this study lacked knowledge of the vestibular and proprioceptive systems and perceptual skills and how they contribute to learning. The participants' limited understanding of proprioception correlates with Pillay's (2018) findings that teachers regarded physical education as an essential part of children's development but had limited knowledge of why it was necessary.

The participants in this study agreed that proprioceptive development may significantly influence mathematics, language and social skills development but they needed some prompting to elaborate on how proprioceptive development contributes to school readiness across different domains. Self-esteem and personal space were mentioned, which aligns with the research showing how proprioception contributes to spatial awareness which then contributes to children's sense of self and their personal space (Botha, 2019; Gallahue & Cleland-Donnelly, 2003; Gligorovic et al., 2011; Loubser et al., 2016; Wan Yunus et al., 2015).

In addition, they noted that children with personal space or sensory integration challenges may experience peer-group conflict because they do not realise how hard they touch other children when they make physical contact. Touch and proprioception integrate on the first level of Ayres' sensory integration theory (1972, 1989) and allow for a developmentally appropriate build up towards eventual motor coordination. Research has also indicated that underdeveloped proprioceptive senses can make children appear clumsy and uncoordinated (du Plooy, 2017; Krog & Kruger, 2011; Parham & Mailloux, 2015). The participants in this study were uncertain regarding the role proprioception plays in children's relationships with their peers, and participants asked for confirmation rather than offering their views on this.

There was consensus among the participants that proprioception played a role in language and mathematics development. According to Hawes et al. (2019), spatial awareness and visualisation can influence mathematical comprehension on various levels. Despite referring to several mathematical skills they believed were influenced by proprioceptive development, the participants did not know whether proprioceptive development affected children's understanding of sequences, such as days of the week and months of the year. However, they mentioned that the children practised these sequences nearly daily but still had difficulty remembering them. Some participants also believed that letter sequences and proprioceptive development are related. Research suggests that proprioception affects temporal awareness, helping children to recognise time, synchronisation, rhythm and sequences (Gallahue & Cleland-Donnelly, 2003; Loubser et al., 2016).

The participants believed that proprioceptive development plays a role in speech and pronunciation, but they were unsure exactly how this affects these skills. They discussed the possibility that proprioceptive development might affect tongue placement and the muscles in the mouth, which, in turn, might affect speech and the volume of speech. De Michael (2016) posited that fine motor skills, which include speech production, require accurate tactile-proprioceptive input. In addition, participants discussed the direction of reading, letter constancy and reversals, mentioning that children with proprioceptive development challenges might be inconsistent when writing on lines and writing letters or numbers in a specific sequence. Often, these children will write over or under the lines, despite their teachers drawing their attention to writing on the line. A review of the research indicates that recognising their position in space helps children to write between the lines, as expected, and leave the appropriate spacing between letters, words and sentences. As such, a correlation exists between children's ability to recognise and correctly write letters and their ability to comprehend spatial concepts (Feder & Majnemer, 2007; Goodwin, 2015; Johnson, 2015; Roessingh & Bence, 2018).

The participants also discussed proprioceptive development's role in executive skills, including planning and organisation. They considered how it may influence how children remember the order of instructions and their ability to plan sequentially. Krog

and Kruger's (2011) research suggests that some of the challenges associated with proprioceptive problems include difficulty dressing and remembering instructions related to motor skills. In addition, Pillay (2018) found that proprioception is significantly involved in planned movements. As a final topic of discussion, the participants discussed concentration challenges in relation to concerning proprioceptive development. The participants concluded that lack of concentration was primarily caused by a lack of body awareness rather than challenges with concentration. Luborsky (2017) found that, as a result of proprioceptive input, the cerebellum becomes alert, which leads to improved concentration.

The participants explored classroom strategies for proprioceptive development, and they identified activities, opportunities and challenges in this regard. They believed that physical activities in class could enhance proprioceptive development and develop spatial awareness. These beliefs are consistent with Recoder's (2019) research, which encourages exercise and multi-sensory activities to stimulate proprioceptive development. The participants referred to Brain Gym® exercises as an efficient method for developing proprioception. Research by Keen (2011) supports this view, finding that sensory activities can provide proprioceptive stimulation to children.

As Recoder (2019) suggests, children' proprioceptive systems are stimulated by a consistent classroom routine with planned transitions and movement breaks throughout the day. It was evident from the participants' comments that movement activities that could be done quickly between lessons were regarded as valuable to allow children to refocus their attention. The participants initially believed their classroom space was unsuitable for proprioceptive development. However, after exploring the possibilities, they found that existing classroom equipment could be used, and children benefited from movement when they worked in smaller groups.

The participants considered the challenges in facilitating activities that develop or stimulate proprioception. They expressed their frustration regarding the lack of time that hinders them in regularly implementing proprioception facilitative activities. Furthermore, they referred to the COVID-19 preventative measures, which resulted in limited outdoor activities and a lack of human contact. Children felt anxious and unable

to express themselves when wearing masks. The participants also envisioned that the full effects of the COVID-19 measures would not be evident for some time. The research has indicated that, while sensory integration occurs naturally in most children during childhood, some children do not develop as effectively as others. Therefore, providing regular proprioceptive input to children can help to enhance coordination, sensory integration and emotional regulation, and prevent inappropriate sensory searching (Akbar, 2020; Clements, 2004; Katzenellenbogen et al., 2021; Sánchez-Lastra et al., 2019).

After exploring their training and professional development, the participants concluded that proprioceptive development might have been addressed in their training but that their primary knowledge of children's social, emotional and physical development came from their work experiences. The participants gained valuable knowledge from the CAPS curriculum, professional development activities, and post-graduate education. This finding, which ties in with the research by Ajani (2019) and Taylor (2019) which posits that, in addition to teacher education, training and development include other aspects, such as professional development activities and in-service training that equip them to facilitate proprioceptive development and school readiness. Ajani (2019) also indicated that professional development activities could improve classroom practices and that in-service training is essential. In addition, the results indicated that the participants had little training in proprioceptive development, as they believed there was no research on this subject during their undergraduate years. It aligns with the findings of Loubser (2015) and Pillay (2018), who found a gap in the knowledge related to perceptual-motor skills (especially proprioception) and physical education.

In the next section, the theoretical framework for this study will be readdressed.

4.4 REVISITING THE CONCEPTUAL FRAMEWORK SUPPORTING THIS STUDY

The theoretical framework of this study was Ayres' sensory integration theory. This theory consists of four levels.

The first level relates to infants receiving information through their near and far senses and their brains learning to interpret it. The second level is where body awareness allows toddlers to develop sensory-motor skills and become more efficient in their motor planning. The third level is where children are developing perceptual-motor skills, refining their spoken language, and improving their foundational skills, after which they are ready for formal academic learning. The fourth level of processing allows children to be more focused and goal-orientated in their activities.

Children are ready for academic learning at the end of this sensory integration process. At the final level of processing, children are more focused and goal-orientated in performing activities. The proprioceptive, vestibular and tactile systems enhance motor coordination, allowing for efficient gross and fine motor skills, visualisation, social competence, self-regulation and self-confidence.

The participants in this study acknowledged the physical, social, emotional, spiritual and academic development as factors to consider when children enter the formal school environment. Even though they did not have a clear understanding of proprioceptive development and what it entails, they were able to discuss and make sense of proprioceptive development's essential role in school readiness. The participants were able to link proprioceptive development to various components of physical, social, emotional, spiritual and academic development and the challenges in school readiness to levels two and three of Ayres' theory.

Furthermore, the participants were awareness of activities that can facilitate proprioceptive development, and they became aware of the suitability of their classroom spaces for these aforementioned types of activities. Challenges the participants experienced in facilitating proprioceptive development in the classroom

were divided into challenges directly related to COVID-19 preventative measures, and challenges not directly related. They believed that the effect of those directly related to the preventative measures will only be visible in the future. The participants also experienced a lack of time to implement more facilitative activities as a challenge. However, they agreed that they needed more training on how to identify and proprioceptive developmental delays and how to support children in their proprioceptive development.

4.5 CONCLUSION

In this chapter, findings from the study were organised and discussed using themes and sub-themes, along with excerpts from interviews. Following this discussion, the findings were compared with existing literature. Chapter 5 summarises what was discussed in this chapter and relates it to the research questions posed in Chapter 1.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

This exploratory case study explored and described six Foundation Phase teachers' views on the role proprioceptive development plays in school readiness at an independent primary school in Pretoria, Gauteng.

Proprioceptive development is part of the physical, social and cognitive functioning of children and thus contributes to school readiness. These areas of development or domains of functioning are the primary indicators of academic readiness and conversely, the readiness of children for school is determined by a developmental assessment of these domains of functioning (Independent Evaluation Group, 2015; Nzunda & Kurniati, 2021). Among the school readiness skills influenced directly and indirectly by proprioception are motor development, spatial awareness, direction awareness, body schema, knowledge of body parts, laterality (direction sense), midline crossing, dominance, time awareness, synchronicity, rhythm, sequencing, handwriting, listening to directions, hand-eye coordination and emotional and social regulation (Blanche & Schaaf, 2001; Koomar & Bundy, 2002; Loubser et al., 2016; Sheedy et al., 2021). The literature also suggests that Foundation Phase teachers may lack adequate knowledge or training regarding proprioceptive development.

Through conducting a focus group, this study explored the views of six Foundation Phase teachers about their knowledge of proprioceptive development and how it relates to school readiness. The purpose of this final chapter is to address the primary research question posed in Chapter 1. This chapter will then reflect on the study's contributions, challenges and limitations. Finally, recommendations for future research will be discussed.

5.2 REFLECTING ON THE RESEARCH QUESTIONS

In answering the primary research question, "What are the views of six Foundation Phase teachers at a Pretoria independent primary school on the role of proprioceptive development in school readiness?", the researcher first considered the secondary research questions which guided the study. The secondary research questions of this study concerned Foundation Phase teachers' knowledge of school readiness, proprioception, proprioceptive development's role in school readiness, classroom activities to facilitate proprioceptive development, and, lastly, their needs for further training and development on proprioception.

5.2.1 Secondary Research Questions

5.2.1.1 Secondary research question one

What knowledge do Foundation Phase teachers have of school readiness?

The participants of the study were of the view that social, emotional, spiritual and academic development all need to be considered when assessing a child's readiness for school. They considered crying, tantrums, emotional outbursts, lack of responsibility and low self-confidence as indicators that children were not yet ready for school. They also believed that separation anxiety and the ability to recognise and regulate emotions were important emotional indicators to consider. According to the participants, chronological age might indicate emotional maturity. In their comments, they noted the time of year when children were born, and suggested monitoring children born later in the year to determine if they were ready to cope with the pressures of Grade 1. In terms of cognitive and academic skills, the participants noted vocabulary delays and difficulty identifying and counting numbers abstractly as indicators. They mentioned that children must be able to write their names. Furthermore, they emphasised the importance of motor skills and muscle tone to academic success.

5.2.1.2 Secondary research question two

What knowledge do Foundation Phase teachers have of proprioception?

The participants could not give a clear definition of proprioception. They were, however, able to describe it in terms of the various senses of how the body moves in space, how people perceive and communicate with the world, and how the limbs communicate with the brain. In addition, the participants lacked knowledge of the vestibular and proprioceptive systems and how these systems contribute to learning.

5.2.1.3 Secondary research question three

What knowledge do Foundation Phase teachers have of the role that proprioceptive development plays in school readiness and which strategies do Foundation Phase teachers apply in their classrooms that may facilitate proprioceptive development?

The participants in this study agreed that proprioceptive development could significantly affect mathematics, language and social skills development. However, some prompting was needed for them to explain the impact of proprioceptive development on school readiness across various domains of functioning. They mentioned self-esteem and noted that children with personal space or sensory integration challenges might experience peer-group conflict as they do not realise how hard they touch others when they make physical contact. As participants in this study were unsure of proprioception's role in children's relationships with their peers, they asked for confirmation rather than sharing their opinions. Proprioception was unanimously agreed upon as an important factor in the development of language and mathematics. The participants believed that proprioceptive development affected several mathematical skills. However, they did not know whether it affected children's understanding of sequences, such as days of the week and months of the year. Despite believing that proprioceptive development is important for speech and pronunciation, the participants were still unclear about exactly how it affects these skills. Some ideas were shared about how proprioceptive development could influence tongue placement and the muscles in the mouth, affecting speech and volume.

The participants also discussed the direction of reading, letter constancy and reversals, mentioning that children with proprioceptive development challenges might have difficulty maintaining a specific sequence of letters or numbers on lines. The participants observed that although children were encouraged to write on the lines, they frequently wrote over or under them. The participants also emphasised the importance of proprioceptive development for executive skills, including planning and organisation. They pondered the thought that it may affect children's memory and ability to schedule their activities sequentially. The participants discussed concentration challenges related to proprioceptive development and they concluded that a lack of body awareness was the primary cause of a lack of concentration.

The participants believed that physical activities in class could enhance proprioceptive development and develop spatial awareness and they cited the Brain Gym® programme as an effective exercise to develop proprioception. The participants underscored the importance of movement activities to help children refocus between lessons. Their classroom space initially seemed unsuitable for developing proprioceptive skills. As they explored the possibilities, they found that existing classroom equipment could be used, and children could benefit from movement when they worked together in smaller groups.

The participants discussed current challenges in facilitating activities that stimulate or develop proprioception. They expressed frustration regarding the lack of time that prevents them from regularly implementing proprioception facilitative activities. Furthermore, they discussed the COVID-19 preventative measures that limited outdoor activities and reduced human contact. Children who wore masks felt anxious and could not express themselves. It was also anticipated that the full effect of COVID-19 measures would not be evident for some time.

Moreover, they expressed the need for further training and development on proprioception. These needs are highlighted in the discussion of secondary research question four.

5.2.1.4 Secondary research question four

What future training needs do Foundation Phase teachers have regarding proprioceptive development and enhancement?

In the process of exploring their knowledge of proprioceptive development and the role that it plays in school readiness, the participants concluded that this might have been addressed in their training but that this training was limited because they believed there was no research on this subject during their undergraduate years. They were of the view that their primary knowledge of children's social, emotional and physical development emanated from their work experiences. The participants felt that they gained valuable knowledge from the CAPS curriculum, professional development activities and post-graduate education. The participants' hesitation when speaking about proprioceptive development suggests the need for further professional development.

5.2.2 Primary Research Question

This section will present the conclusions relating to the primary research question as stated in Chapter 1: *"What are the views of six Foundation Phase teachers at an independent primary school in Pretoria on the role of proprioceptive development in school readiness?"*

It was evident in this study that the participants understood what school readiness is and what it entails and were very confident about their knowledge of this. They understood the different domains of functioning that contribute to school readiness and knew what to look for to determine whether children are ready for school. The participants were, however, less familiar with proprioception and less confident when sharing their knowledge. They were hesitant to explain what proprioceptive development entails but demonstrated knowledge of the types of activities that facilitate proprioceptive development in the classroom. Their uncertainty was also apparent from their need to learn more about proprioceptive development and how to support children with proprioceptive development challenges.

5.3 POTENTIAL CONTRIBUTIONS OF THE STUDY

This study provided insight into the views of six Foundation Phase teachers at an independent primary school in Pretoria. The participants' views provided insight into how they acquired their knowledge of school readiness and showed their lack of knowledge on proprioception and its role in school readiness. This highlights the need for more in-depth training of Foundation Phase teachers on proprioceptive development and how to facilitate its development. This qualitative study could potentially serve as a starting point to guide future research into how Foundation Phase teachers can be trained on the role of proprioceptive development in school readiness and how proprioceptive development can be facilitated in Foundation Phase children.

This study could raise awareness among Foundation Phase teachers about proprioceptive development and how they can allow for more developmental activities in their classroom environment. This could lead to the reflection on their own experiences and may result in them seeking further professional development that would improve proprioceptive facilitation in the classroom.

5.4 CHALLENGES AND LIMITATIONS OF THE STUDY

This study was conducted during COVID-19. The researcher initially intended to conduct research at a public primary school which was close in proximity and familiar to her. However, due to the COVID-19 restrictions and preventative measures, using a public-school research site would have delayed the research process indefinitely. The researcher decided to include teachers from an independent primary school instead. The newly selected site and participants still met the criteria for the researcher's purposeful and convenient selection of participants and site. However, due to the limited number of staff members at the school, the researcher also decided to include Grade 2 teachers as participants. These participants were included because they teach in the Foundation Phase, and they often experience the delayed effects of children who enter the school environment unprepared for formal academic learning.

5.5 RECOMMENDATIONS FOR RESEARCH

Based on the findings of this study, the following recommendations are recommended for future research:

- In this study, it became evident that Foundation Phase teachers are not familiar with the relationship between school readiness and proprioception. Due to the small size of the sample, it would be prudent to further explore this seeming lack of knowledge by using a larger sample with a survey study.

- From this study, it appeared as though Foundation Phase teachers need more training on proprioceptive development. It may be a valuable addition to the field of knowledge to do a qualitative study about the training Foundation Phase teachers receive during their undergraduate studies. This study could be completed by generating data from the different universities in South Africa, via interviews and discussion groups.

- This study found that teachers have specific training needs that can be addressed. An in-depth study to determine what their specific needs are can contribute to the development of more targeted professional development programmes and workshops.

5.6 CONCLUDING REMARKS

The purpose of this exploratory case study was to explore and describe the views of Foundation Phase teachers on the role of proprioceptive development in school readiness. Even though this study's sample and scope were limited, its findings might help guide the development of teacher training programmes for facilitating proprioceptive development. This study indicates that Foundation Phase teachers understand the importance of proprioceptive development in school readiness and are aware of its role in preparing children for formal academic learning. Their responses demonstrated an awareness of its role within the physical, socio-emotional and cognitive domains, although their more detailed knowledge was limited. Among others, participants suggested activities in their classrooms to facilitate the development of proprioceptive skills, along with ways to make the classrooms conducive for such activities. Participants referred to contextual challenges, such as COVID-19 preventative measures and time constraints, which are more commonly

acknowledged. The participants specifically expressed a need for further professional development and training on identifying proprioceptive development challenges and how to facilitate proprioceptive development in the classroom. Therefore, the findings of this study can be regarded as a starting point for research into developing a professional development training programme for Foundation Phase teachers in South Africa.

REFERENCES

Adelman, C., Jenkins, D., & Kemmis, S. (1976). Re-thinking case study: Notes from the second Cambridge conference. *Cambridge Journal of Education*, *6*(3), 139-150. https://doi.org/10.1080/0305764760060306

Ahmed, S. F., Tang, S., Waters, N. E., & Davis-Kean, P. (2019). Executive function and academic achievement: Longitudinal relations from early childhood to adolescence. *Journal of Educational Psychology, 113(3)*, 446-461. http://dx.doi.org/10.1037/edu0000296

Ajani, O. A. (2019). Understanding teachers as adult learners in professional development activities for enhanced classroom practices. *AFRIKA Journal of Politics, Economics and Society, 9*(2), 195-208. https://www.proquest.com/docview/2349159695?accountid=14717

Akbar, Z. (2020, October). Motoric stimulation on early childhood development. *3rd International conference on education, science, and technology* (ICEST 2019) (pp. 88-92). Atlantis Press. https://www.atlantis-press.com/article/125945425.pdf

Alharahsheh, H. H., & Pius, A. (2020). A review of key paradigms: Positivism VS interpretivism. *Global Academic Journal of Humanities and Social Sciences*, *2*(3), 39-43. https://doi.org/10.36348/gajhss.2020.v02i03.001

Al Riyami, T. (2015). Main approaches to educational research. *International Journal of Innovation and Research in Educational Sciences*, *2*(5), 412-416. https://www.researchgate.net/publication/283071843

Astbury, B. (2009). *Evaluation of transition: A positive start to school pilots*. University of Melbourne Centre for Program Evaluation. *https://www.education.vic.gov.au/Documents/about/research/transitionpilotevaluation.pdf*

Avci, M. (2017). Making sense of sensory processing. *Educating Young Children: Learning and Teaching in the Early Childhood Years, 23*(3), 42-44. https://ecta.org.au/wp-content/uploads/2019/06/ECTA-Educating_Young_Children-23.3_2017.pdf

Ayres, A. J. (1961). Development of the body scheme in children. *The American Journal of Occupational Therapy: Official Publication of the American Occupational Therapy Association*, *15*, 99-102.

Ayres, A. J. (1972). *Sensory integration and the child*. Western Psychological Services.

Ayres, A. J. (1972a). Improving academic scores through sensory integration. *Journal of Learning Disabilities*, *5*(6), 338-343.

Ayres, A. J. (1972b). *Sensory integration and learning disorders*. Western Psychological Services.

Ayres, A. J. (1972c). *Southern California sensory integration tests.* Western Psychological Services.

Ayres, A. J. (1972d). Types of sensory integrative dysfunction among disabled learners. *American Journal of Occupational Therapy*, *26*, 13-18.

Ayres, A. J. (1989). *Sensory integration and praxis tests manual*. Western Psychological Services.

Ayres, A. J., Robbins, J., & Pediatric Therapy Network. (2005). *Sensory integration and the child: Understanding hidden sensory challenges.* 25th anniversary ed., rev. and updated by Pediatric Therapy Network. WPS.

Basaran, M., & Aksoy, A. B. (2020). *School readiness in pre-school period: A systematic review.* https://www.researchgate.net/publication/344014909

Beatson, J. (2020). *Play based natural environments and language development in young children* [Unpublished doctoral dissertation]. Auckland University of Technology. https://openrepository.aut.ac.nz/bitstream/handle/10292/13184/BeatsonJ2.pdf?sequence=5

Behar-Horenstein, L. S., (2018). Qualitative research methods. In B. B. Frey (Ed.), *The Sage encyclopedia of educational research, measurement, and evaluation* (pp. 1340-1345). Sage.

Bender, S. L.., Pham, A. V., & Carlson, J. S. (2011). School readiness. In S. Goldstein & J. A. Naglieri (Eds.), *Encyclopedia of child behavior and development* (pp. 1297-1298). Springer.

Benn, D. (2017). ADHD and sensory integration disorders. *Mental Health Matters*, *4*(3), 14-16. https://sadag.org/images/pdf/ADHD-and-sensory-integration-disorders.pdf

Benner, P. (2008). Interpretive phenomenology. In L. M. Given (Ed.), *The Sage encyclopedia of qualitative research methods* (pp. 461-464). Sage.

Berk, L. E. (2019). *Exploring child development*. Pearson.

Bernstein, D. A., & Nash, P. W. (2008). *Essentials of psychology*. Houghton Mifflin.

Berryman, D. R. (2019). Ontology, epistemology, methodology, and methods: Information for librarian researchers. *Medical Reference Services Quarterly*, *38*(3), 271-279. https://doi.org/10.1080/02763869.2019.1623614

Beuving, J., & de Vries, G. (2015). *Doing qualitative research: The art of naturalistic inquiry*. Amsterdam University Press.

Bhutta, A. T., Cleves, M. A., Casey, P. H., Cradock, M. M., & Anand, K. J. (2002). Cognitive and behavioral outcomes of school-aged children who were born preterm: A meta-analysis. *Jama*, *288*(6), 728-737. http://dx.doi.org/10.1001/jama.288.6.728

Bickel, D. D., Zigmond, N., & Strayhorn, J. (1991). Chronological age at entrance to first grade: Effects on elementary school success. *Early Childhood Research Quarterly*, *6*(2), 105-117. https://doi.org/10.1016/0885-2006(91)90001-2

Blair, C., & Raver, C. C. (2015). School readiness and self-regulation: A developmental psychobiological approach. *Annual Review of Psychology*, *66*, 711-731. https://doi.org/10.1146/annurev-psych-010814-015221.

Blanche, E. I., & Schaaf, R. C. (2001). Proprioception: A cornerstone of sensory integrative intervention. In E. I. Blanche & R. C. Schaaf (Eds.), *Understanding the nature of sensory integration with diverse populations*. Therapy Skill Builders.

Blythe, S. G. (2005). Releasing educational potential through movement: A summary of individual studies carried out using the INPP test battery and developmental exercise programme for use in schools with children with special needs. *Child Care in Practice*, *11*(4), 415-432. https://doi.org/10.1080/13575270500340234

Bodovski, K., & Youn, M. J. (2011). The long-term effects of early acquired skills and behaviors on young children's achievement in literacy and mathematics. *Journal of Early Childhood Research*, *9*(1), 4-19. https://doi.org/10.1177/1476718X10366727

Boisgontier, M. P., & Swinnen, S. P. (2014). Proprioception in the cerebellum. *Frontiers in Human Neuroscience*, *8*. https://doi.org/10.3389/fnhum.2014.00212

Boyd, L. A., & Sobieraj, S. L. (2013). *Kindergarten readiness: The impact of sensory integration on preschool children's readiness for the transition to kindergarten*. https://doi.org/10.33015/dominican.edu/2013.OT.05

Botha, S. (2019). *The effect of a perceptual-motor intervention on the motor proficiency, letter recognition and formation of selected Grade 1 children* [Unpublished doctoral dissertation]. Stellenbosch University. https://scholar.sun.ac.za/bitstream/handle/10019.1/106954/botha_effect_2019.pdf?sequence=1

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, *53*(1), 371-399. https://edisciplinas.usp.br/pluginfile.php/2193406/mod_resource/content/1/SOCIOECONOMIC%20STATUS%20AND%20CHILD%20DEVELOPMENT.pdf

Braun, V., & Clarke, V. (2012). Thematic analysis. In H. Cooper (Ed.), *APA handbook of research methods in psychology* (Vol. 2, pp. 57-71). American Psychological Association. https://doi.org/10.1037/13620-004

Bredekamp, S. (2017). *Effective practices in early childhood education: Building a foundation* (3rd ed.). Pearson.

Britto, P. R. (2012). *School readiness: A conceptual framework*. United Nations Children's Fund. https://resources.leicestershire.gov.uk/sites/resource/files/field/pdf/2020/1/7/School-readiness-a-conceptual-framework-UNICEF.pdf

Buckle, F., Franzsen, D., & Bester, J. (2011). The effect of the wearing of weighted vests on the sensory behaviour of learners diagnosed with attention deficit hyperactivity disorder within a school context. *South African Journal of Occupational Therapy*, *41*(3), 37-41. http://www.scielo.org.za/pdf/sajot/v41n3/08.pdf

Bundy, A. C., & Lane, S. J. (2020). Sensory integration: Jean Ayres' theory revisited. In A. C. Bundy & S. J. Lane (Eds.), *Sensory integration: Theory and practice* (3rd ed., pp. 2-20). F.A. Davis.

Burchinal, M., Magnuson, K., Powell, D., & Hong, S. S. (2015). Early childcare and education. In R. M. Lerner (Ed.), *Handbook of child psychology and developmental science* (Vol. 4, pp. 223-267). John Wiley & Sons, Inc. https://doi.org/10.1002/9781118963418.childpsy406

Burchinal, M., Foster, T. J., Bezdek, K. G., Bratsch-Hines, M., Blair, C., Vernon-Feagans, L., & Family Life Project Investigators. (2020). School-entry skills predicting school-age academic and social–emotional trajectories. *Early Childhood Research Quarterly*, *51*, 67-80. https://doi.org/10.1016/j.ecresq.2019.08.004

Cambridge University Press (n.d.). *Awareness*. https://dictionary.cambridge.org/dictionary/english/awareness

Cambridge University Press (n.d.). *Challenge*. https://dictionary.cambridge.org/dictionary/english/challenge

Cambridge University Press (n.d.). *Professional*. https://dictionary.cambridge.org/dictionary/english/professional

Carney, T., Browne, F. A., Myers, B., Kline, T. L., Howard, B., & Wechsberg, W. M. (2019). Adolescent female school dropouts who use drugs and engage in risky sex: effects of a brief pilot intervention in Cape Town, South Africa. *AIDS Care*, *31*(1), 77-84. https://doi.org/10.1080/09540121.2018.1500008

Case-Smith, J. (2010). An overview of occupational therapy for children. In J. Case-Smith & J. Clifford O'Brien (Eds.), *Occupational therapy for children* (6th ed., pp. 1-21). Mosby.

Chandra, R. (2017). School readiness in India. *Har Simrat Kaur*, *42*(4), 23. https://ncert.nic.in/pdf/publication/journalsandperiodicals/journalofindianeducatio n/JIE_FEB_2017.pdf

Chang, F., & Burns, B. M. (2005). Attention in preschoolers: Association with effortful control and motivation. *Child Development*, *76*(1), 247-263. https://doi.org/10.1111/j.1467-8624.2005.00842.x

Cheatum, B. A., & Hammond, A. A. (2000). *Physical activities for improving children's learning and behavior: A guide to sensory motor development.* Human Kinetics.

Cheng, Y. L., & Mix, K. S. (2014). Spatial training improves children's mathematics ability. *Journal of Cognition and Development*, *15*, 2-11. https://doi.org/10.1080/15248372.2012.725186

Chowdhury, I. A. (2015). Issue of quality in qualitative research: An overview. *Innovative Issues and Approaches in Social Sciences*, *8*(1), 142-162. http://dx.doi.org/10.12959/issn.1855-0541.IIASS-2015-no1-art09

Chu, V. W. T. (2017). Assessing proprioception in children: A review. *Journal of Motor Behavior*, *49*(4), 458-466. https://doi.org/10.1080/00222895.2016.1241744

Clark, J. E., & Metcalfe, J. S. (2002). The mountain of motor development: A metaphor. In J. E. Clark & J. Humphrey (Eds.), *Motor development: Research and reviews* (Vol. 2, pp. 163-190). NASPE Publications.

Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary Issues in Early Childhood*, *5*(1), 68-80. https://doi-org.uplib.idm.oclc.org/10.2304/ciec.2004.5.1.1

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). Routledge.

Coleman, R., Piek, J. P., & Livesey, D. J. (2001). A longitudinal study of motor ability and kinaesthetic acuity in young children at risk of developmental coordination disorder. Human Movement Science*, 20(1-2), 95-110.* https://doi.org/10.1016/s0167-9457(01)00030-6

Constantino, T. E. (2008). Constructivism. In L. Given (Ed.), *The Sage encyclopedia of qualitative research* (pp. 116-120). Sage.

Cornhill, H., & Case-Smith, J. (1996). Factors that relate to good and poor handwriting. *American Journal of Occupational Therapy*, *50(9), 732-739.* https://doi.org/10.5014/ajot.50.9.732

Cornu, V., Hornung, C., Schiltz, C., & Martin, R. (2017). How do different aspects of spatial skills relate to early arithmetic and number line estimation? *Journal of Numerical Cognition*, *3*(2), 309-343. https://doi.org/10.5964/jnc.v3i2.36

Council of Economic Advisers United States (2015). *The economics of early childhood investments.* Council of Economic Advisers United States. https://obamawhitehouse.archives.gov/sites/default/files/docs/early_childhood_report_update_final_non-embargo.pdf

Creswell, J. W. (2015). *Educational research: planning, conducting and evaluating quantitative and qualitative research* (5th ed.). Pearson.

Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative and mixed methods approaches* (5th ed.). Sage.

Creswell, J. W., & Creswell Báez, J. (2020). *30 Essential skills for the qualitative researcher* (2nd ed.). Sage.

Csapó, B. (2013, April 27–May 1). *The predictive validity of school readiness assessments: Results from an eight-year longitudinal study* [Paper presentation]. 2013 Annual Meeting of the American Educational Research Association, San Francisco. http://publicatio.bibl.u-szeged.hu/9577/1/2013_Csapo_AERA.pdf

Daly, C. J., Kelley, G. T., & Krauss, A. (2003). Relationship between visual-motor integration and handwriting skills of children in kindergarten: A modified replication study. *The American Journal of Occupational Therapy*, *57*(4), 459-462. https://doi.org/10.5014/ajot.57.4.459

Dangol, R., & Shrestha, M. (2019). Learning readiness and educational achievement among school students. *The International Journal of Indian Psychology*, *7*(2), 467-476. https://www.researchgate.net/publication/333673489

Danna, J., & Velay, J. L. (2015). Basic and supplementary sensory feedback in handwriting. *Frontiers in Psychology, 6, 169.* https://doi.org/10.3389/fpsyg.2015.00169

Davoudzadeh, P., McTernan, M. L., & Grimm, K. J. (2015). Early school readiness predictors of grade retention from kindergarten through eighth grade: A multilevel discrete-time survival analysis approach. *Early Childhood Research Quarterly*, *32*, 183-192. https://doi.org/10.1016/j.ecresq.2015.04.005

De Franchis, V., Usai, M. C., Viterbori, P., & Traverso, L. (2017). Preschool executive functioning and literacy achievement in Grades 1 and 3 of primary school: A longitudinal study. *Learning and Individual Differences*, *54*, 184-195. https://doi.org/10.1016/j.lindif.2017.01.026

Deisher, J. L., & Hikes, J. P. (2016). *Handwriting development: Educating parents at children's playroom*. https://jayscholar.etown.edu/otstu/11

De Jager, M. (2014). *Ready to learn, ready for school*. Metz Press.

Delport, C. S. L., & Fouché, C. B. (2005). The qualitative research report. In A. de Vos (Ed.), *Research at grassroots* (3rd ed., pp. 350-354). Van Schaik.

De Michael, K. (2016). *Sensory processing handbook for early childhood educators* [Unpublished Master's thesis]. Bank Street College. http://educate.bankstreet.edu/independent-studies/161

Dennis, J. L., & Swinth, Y. (2001). Pencil grasp and children's handwriting legibility during different-length writing tasks. *American Journal of Occupational Therapy*, *55*(2), 175-183. https://doi.org/10.5014/ajot.55.2.175

Department of Basic Education (2010). *Education statistics in South Africa 2009.* Government Printer. https://www.gov.za/sites/default/files/gcis_document/201409/doestatisticssouthafrica0.pdf

Department of Basic Education (2021). *National senior certificate 2020 examination report.* Government Printer. https://www.education.gov.za/Portals/0/Documents/Reports/2021%20NSC%20Reports/2020NSCREPORT.pdf?ver=2021-07-19-142304-897

Department of Social Services (2007). Children's Amendment Act No. 41 of 2007. *Government Gazette*, *Vol. 513*, No. 30884 (18 March 2008). Government Printer. https://www.gov.za/sites/default/files/gcis_document/201409/a41-070.pdf

De Quirós, J. B., & Schrager, O. L. (1979). *Neuropsychological fundamentals in learning disabilities*. Academic Therapy Publications*.*

De Witt, M. W. (2016). *The young child in context. A thematic approach* (2nd ed.). Van Schaik Publishers.

Dinehart, L. H. (2015). Handwriting in early childhood education: Current research and future implications. *Journal of Early Childhood Literacy, 15*(1), 97-118. https://doi.org/10.1177/1468798414522825

DiPerna, J. C., Bailey, C. G., & Anthony, C. (2014). Broadband screening of academic and social behavior. In R. J. Kettler, T. A. Glover, C. A. Albers & K. A. Feeney-Kettler (Eds.), *Universal screening in educational settings: Evidence-based decision making for schools* (pp. 223-248). American Psychological Association. https://doi.org/10.1037/14316-009

Dockett, S., & Perry, B. (2002). Who's ready for what? Young children starting school. *Contemporary Issues in Early Childhood*, *3*(1), 67-89. https://doi.org/10.2304/ciec.2002.3.1.9

Dockett, S. & Perry, B. (2014). Research to policy: Transition to school position statement. In *Transitions to school – international research, policy and practice* (pp. 277-294). Springer.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428-1446. https://doi.org/10.1037/0012-1649.43.6.1428

Duncan, G. J., & Magnuson, K. A. (2005). Can family socioeconomic resources account for racial and ethnic test score gaps? *The Future of Children*, *15*(1), 35–54. http://www.jstor.org/stable/1602661

Duncan, G. J., & Magnuson, K. A. (2011). The nature and impact of early achievement skills, attention skills, and behavior problems. In G. J. Duncan & R. J. Murnane (Eds.), *Whither opportunity: Rising inequality, schools, and children's life chances*. Russel Sage. https://www.researchgate.net/publication/303150876

Duncan, R. J., Schmitt, S. A., Burke, M., & McClelland, M. M. (2018). Combining a kindergarten readiness summer program with a self-regulation intervention improves school readiness. *Early Childhood Research Quarterly*, *42*, 291-300. https://doi.org/10.1016/j.ecresq.2017.10.012

 Dunn, W. (2007). Supporting children to participate successfully in everyday life by using sensory processing knowledge. *Infants and Young Children*, *20*(2), 84-101. https://doi.org/10.1097/01.IYC.0000264477.05076.5d

Du Plessis, E. (2016). Etiese aspekte in navorsing. In I. Joubert, C. Hartell & K. Lombard (Ed.), *Navorsing: 'n Gids vir die beginnernavorser* (pp. 73-92). Van Schaik.

du Plooy, M. (2017). *Sensory integration difficulties and dysfunctions in children with fetal alcohol spectrum disorders* [Doctoral dissertation]. University of the Free State. https://scholar.ufs.ac.za/bitstream/handle/11660/7693/DuPlooyM.pdf?sequence=1&isAllowed=y

Dyer, J. R. (2002). Cognitive development. In N. J. Salkind (Ed.), *Child development* (pp. 87-92). Macmillan.

Ebbesen, D., & Olsen, J. (2018). Motor intention/intentionality and associationism - A conceptual review. *Integrative Psychological and Behavioral Science, 52*(4), 565-594. https://doi.org/10.1007/s12124-018-9441-y

Elena, S., Georgeta, N., Cecila, G., & Lupu, E. (2014). Perceptual-motor development of children in elementary school. *Procedia-Social and Behavioral Sciences, 114*, 632-636. https://doi.org/10.1016/j.sbspro.2013.12.759

Erasmus, M., Janse van Rensburg, O., Pienaar, A. E., & Ellis, S. (2016). The effect of a perceptual-motor intervention programme on learning readiness of Grade R learners from South African deprived environments. *Early Child Development and Care, 186*(4), 596-611. https://doi.org/10.1080/03004430.2015.1048245

Erikson, E. (1963). *Childhood and society* (2nd ed.). New York.

Fabes, R. A., Frosch, C. A., & Buchanan, A. (2002). Emotional development. In N. J. Salkind (Ed.), *Child development* (pp. 133-137). Macmillan.

Fauconnier, J. (2006). *Developing indicators of emotional school readiness of South African children and possible therapeutic use thereof* [Unpublished doctoral dissertation]. University of Pretoria. https://repository.up.ac.za/bitstream/handle/2263/27894/00dissertation.pdf?sequence=1

Feder, K. P., & Majnemer, A. (2007). Handwriting development, competency, and intervention. *Developmental Medicine & Child Neurology, 49*(4), 312-317. https://doi.org/10.1111/j.1469-8749.2007.00312.x

Ferlinc, A., Fabiani, E., Velnar, T., & Gradisnik, L. (2019). The importance and role of proprioception in the elderly: A short review. *Materia Socio-Medica*, *31*(3), 219. https://doi.org/10.5455/msm.2019.31.219-221

Fink, A. (2015). *How to conduct surveys: A step-by-step guide* (6th ed.). Sage.

Finlay, L. (2011). *Phenomenology for therapists: Researching the lived world*. J. Wiley & Sons. https://ebookcentral-proquest-com.uplib.idm.oclc.org/lib/pretoria-ebooks/reader.action?docID=819252&ppg=1

Fisher, A., Murray, E., & Bundy, A. (1991). *Sensory integration: Theory and practice*. F.A. Davis.

Flatters, I., Mushtaq, F., Hill, L. J., Holt, R. J., Wilkie, R. M., & Mon-Williams, M. (2014). The relationship between a child's postural stability and manual dexterity. *Experimental Brain Research*, *232*(9), 2907-2917. https://doi.org/10.1007/s00221-014-3947-4

Gallahue, D. L., & Cleland-Donnelly, F. (2003). *Developmental physical education for today's children.* Human Kinetics.

Gambold, L. L. (2010). Field notes. In A. J. Mills, G. Durepos & E. Wiebe (Eds.), *Encyclopedia of case study research* (Vol. 1, pp. 396-396). Sage.

Geiger, R. E. (2019). *Preschool self-regulation: A predictor of school readiness*. https://digitalcommons.wku.edu/cgi/viewcontent.cgi?article=4127&context=theses

Gerring, J. (2007). *Case study research: Principles and practices.* Cambridge University Press.

Gierat, B. (2012). Fine motor control and indicators of school readiness 6-year-old children. In G. Juras & K. Slomka (Eds.), *Current research in motor control IV* (pp. 30-34). Academy of Physical Education in Katowice.

Gligorovic, M., Radic Sestic, M., Nikolic, S., & Ilic Stosovic, D. (2011). Perceptual-motor abilities and prerequisites of academic skills. *Specijalna Edukacija I Rehabilitacija*,*10*(3), 405-434. http://rfasper.fasper.bg.ac.rs/handle/123456789/550

Goodway, J. D., Ozmun, J. C., & Gallahue, D. L. (2019). *Understanding motor development: Infants, children, adolescents, adults*. Jones & Bartlett Learning.

Goodwin, M. K. (2015). *The effect of a gross motor intervention programme on perceptual-motor skills and academic readiness in preschool children* [Unpublished doctoral dissertation]. University of Stellenbosch. http://hdl.handle.net/10019.1/96986

González-Grandón, X., Falcón-Cortés, A., & Ramos-Fernández, G. (2021). Proprioception in action: A matter of ecological and social interaction. *Frontiers in Psychology, 11*, 569403. https://doi.org/10.3389/fpsyg.2020.569403

Greeff, M. (2005). *Information collection: Interviewing. In A. de Vos (Ed.), Research at grassroots* (3rd ed, pp. 286-313). Van Schaik.

Greene, J. (2010). Knowledge accumulation: Three views on the nature and role of knowledge in social science. In W. Luttrell (Ed.), *Qualitative educational research: Readings in reflexive methodology and transformative practice* (pp. 63-77). New York.

Grissmer, D., Grimm, K. J., Aiyer, S. M., Murrah, W. M., & Steele, J. S. (2010). Fine motor skills and early comprehension of the world: Two new school readiness indicators. *Developmental Psychology*, *46*(5), 1008. https://doi.org/10.1037/a0020104

Grix, J. (2018). *The foundations of research*. Macmillan International Higher Education.

Grove, M. C., & Hauptfleisch, H. M. A. M. (1978). *Perseptuele ontwikkeling.* Gutenberg.

Guba, E. G., & Lincoln, Y. S. (1989). *Fourth generation evaluation*. Sage.

Guba, E. G., & Lincoln, Y. S. (2005). Paradigmatic controversies, contradictions, and emerging confluences. In N. K. Denzin & Y. S. Lincoln (Eds.), *The SAGE handbook of qualitative research* (pp. 191-216). Sage.

Gullo, D. F. (2018). A structural model of early indicators of school readiness among children of poverty. *Journal of Children and Poverty*, *24*(1), 3-24. http://dx.doi.org/10.1080/10796126.2017.1401899

Gumora, G., & Arsenio, W. F. (2002). Emotionality, emotion regulation, and school performance in middle school children. *Journal of School Psychology*, *40*(5), 395-413. https://doi.org/10.1016/S0022-4405(02)00108-5

Gunderson, E. A., Ramirez, G., Beilock, S. L., & Levine, S. C. (2012). The relation between spatial skill and early number knowledge: The role of the linear number line: Correction to Gunderson et al. (2012). *Developmental Psychology*, *48*(5), 1241. https://doi.org/10.1037/a0028593

Hamerslag, R., Oostdam, R., & Tavecchio, L. (2018). Inside school readiness: the role of socioemotional and behavioral factors in relation to school, teachers, peers and academic outcome in kindergarten and first grade. *European Early Childhood Education Research Journal*, *26*(1), 80-96. https://doi.org/10.1080/1350293X.2018.1412035

Hammarberg, K., Kirkman, M., & de Lacey, S. (2016). Qualitative research methods: when to use them and how to judge them. *Human Reproduction (Oxford, England)*, *31*(3), 498-501. https://doi.org/10.1093/humrep/dev334

Han, J., Waddington, G., Adams, R., Anson, J., & Liu, Y. (2016). Assessing proprioception: A critical review of methods. *Journal of Sport and Health Science*, *5*(1), 80-90. https://doi.org/10.1016/j.jshs.2014.10.004

Hansson, E. E., Beckman, A., & Håkansson, A. (2010). Effect of vision, proprioception, and the position of the vestibular organ on postural sway. *Acta oto Laryngologica*, *130*(12), 1358-1363. http://dx.doi.org/10.3109/00016489.2010.498024

Harcourt, I. M. (2018). *The effect of a perceptual-motor intervention on the school readiness of Grade R learners* [Unpublished doctoral dissertation]. University of Pretoria. https://repository.up.ac.za/bitstream/handle/2263/70108/Harcourt_Effect_2019.pdf?sequence=1

Hartell, C., & Bosman, L. (2016). Beplanning van 'n navorsingsvoorstel vir nagraadse studie. In I. Joubert, C. Hartell & K. Lombard (Ed.), *Navorsing: 'n Gids vir die beginnernavorser* (pp. 19-49). Van Schaik.

Harrington, E. M., Trevino, S. D., Lopez, S., & Giuliani, N. R. (2020). Emotion regulation in early childhood: Implications for socioemotional and academic components of school readiness. *Emotion, 20*(1), 48. http://dx.doi.org/10.1037/emo0000667

Hawes, Z., Moss, J., Caswell, B., Seo, J., & Ansari, D. (2019). Relations between numerical, spatial, and executive function skills and mathematics achievement: A latent-variable approach. *Cognitive Psychology, 109*, 68-90. https://doi.org/10.1016/j.cogpsych.2018.12.002

Hayton, J. A. (2017). *Get your coat: examining the development of independent dressing skills in young children with visual impairment in comparison with young children with down syndrome and typically developing children* [Unpublished doctoral dissertation]. University College London. https://discovery.ucl.ac.uk/id/eprint/1541120/1/Jessica%20Hayton%20Thesis.pdf

Health Professions Council of South Africa (2016). *Booklet 13: General ethical guidelines for health researchers.* https://www.hpcsa.co.za/Uploads/Professional_Practice/Conduct%20%26%20Ethics/Booklet%2013%20Gen%20Ethical%20Guidelines%20for%20Health%20Researchers.pdf

Health Professions Council of South Africa (2021). *Booklet 1: General ethical guidelines for health care professions.* https://www.hpcsa.co.za/Uploads/Professional_Practice/Conduct%20%26%20Ethics/Booklet_1_Guidelines_for_Good_Practice_Dec_2021.pdf

Health Professions Council of South Africa (2022). *Ethical guidelines for good practice in the health care professions.* https://www.hpcsa.co.za/Uploads/Professional_Practice/Ethics_Booklet.pdf

Heidegger, M. (1962). *Being and time*. Harper and Row.

Heroux, M. E., Butler, A. A., Robertson, L. S., Fisher, G., & Gandevia, S. C. (2022). Proprioception: A new look at an old concept. *Journal of Applied Physiology*, *132*(3), 811-814. https://doi.org/10.1152/japplphysiol.00809.2021

High, P. C., & Committee on early childhood, adoption, and dependent care. (2008). School readiness. *Pediatrics, 121*(4), e1008-e1015. https://doi.org/10.1542/peds.2008-0079

Hill, N. E., Castellino, D. R., Lansford, J. E., Nowlin, P., Dodge, K. A., Bates, J. E., & Pettit, G. S. (2004). Parent academic involvement as related to school behavior, achievement, and aspirations: Demographic variations across adolescence. *Child Development*, *75*(5), 1491-1509. https://doi.org/10.1111/j.1467-8624.2004.00753.x

Hiller, J. (2016). Epistemological foundations of objectivist and interpretivist research. In K. M. Murphy & B. L. Wheeler (Eds.), *Music therapy research* (3rd ed, pp.99-127.). Barcelona Publishers.

Hird, M. J. (2003). Case study. In R. L. Miller & J. D. Brewer (Eds.), *The A–Z of social research: A dictionary of key social science research concepts* (pp. 22-24). Sage.

Hitchcock, G., & Hughes, D. (1995). *Research and the teacher* (2nd ed). Routledge.

Houri, A. K., & Miller, F. G. (2020). A systematic review of universal screeners used to evaluate social-emotional and behavioral aspects of kindergarten readiness. *Early Education and Development*, *31*(5), 653-675. https://doi.org/10.1080/10409289.2019.1677132

Hutton, P. (2012). *Investigation into the prevalence of sensory processing difficulties in children identified as having behavioural, emotional or social difficulties at school* [Unpublished doctoral dissertation]. Cardiff University. https://orca.cardiff.ac.uk/id/eprint/42131

Idoni, J., Taub, M. B., & Harris, P. A. (2014). *A comparison of two tests of visual-motor integration.* Optometry & Visual Performance.

Iphofen, R., & Tolich, M. (2018). Foundational issues in qualitative research ethics. In R. Iphofen & M. Tolich (Eds.), *The SAGE handbook of qualitative research ethics* (pp. 1-18). Sage.

Independent Evaluation Group (2015). *World bank support to early childhood development: An independent evaluation*. https://openknowledge.worldbank.org/bitstream/handle/10986/33198/World-Bank-support-to-early-childhood-development-an-independent-evaluation.pdf?sequence=1

Ivankova, N. V. (2014). Implementing quality criteria in designing and conducting a sequential QUAN-> QUAL mixed methods study of student engagement with learning applied research methods online. *Journal of Mixed Methods Research*, *8*(1), 25-51. https://doi.org/10.1177/1558689813487945

Jacobs, J. (2020). *An assistive intervention for midline crossing therapy using an agile approach* [Unpublished master's thesis]. University of Johannesburg. https://hdl.handle.net/10210/479279

Jacobs, J., Heymann, R., & Greeff, J. J. (2021). A telehealth system incorporating a serious game intervention to aid occupational therapists in identifying and treating children with difficulty crossing the body's midline: Key informant interviews among occupational therapists. *JMIR Serious Games*, *9*(4), e27761. https://doi.org/10.2196/27761

James, N. (2008). Authenticity. In L. M. Given (Ed.), *The Sage encyclopedia of qualitative research methods* (p. 44). Sage.

Janse van Rensburg, J. M., & Erasmus, M. (2016). Grade R learners' school and learning readiness from Bronfenbrenner's ecological perspective. In M. A. Mokoena & I. J. Oosthuizen (Eds.), *A scholarly contribution to educational praxis* (pp. 1-30). AOSIS. http://dx.doi.org/10.4102/aosis.2016.saep12.01

Janus, M., & Duku, E. (2007). The school entry gap: Socioeconomic, family, and health factors associated with children's school readiness to learn. *Early Education and Development, 18*(3), 375-403. https://doi.org/10.1080/10409280701610796a

Jenkinson, J., Hyde, T., & Ahmad, S. (2008). *Building blocks for learning: Occupational therapy approaches*. John Wiley & Sons Ltd.

Jensen, D. (2008). Transferability. In L. M. Given (Ed.), *The Sage encyclopedia of qualitative research methods* (p. 886). Sage.

Jiang, G. P., Jiao, X. B., Wu, S. K., Ji, Z. Q., Liu, W. T., Chen, X., & Wang, H. H. (2018). Balance, proprioception, and gross motor development of Chinese children aged 3 to 6 years. *Journal of Motor Behavior*, *50*(3), 343-352. https://doi.org/10.1080/00222895.2017.1363694

Johnson, B., & Christensen, L. B. (2017). *Educational research: quantitative, qualitative, and mixed approaches* (6th ed.). Sage.

Johnson, S. R., & House, R. (2014). *Teaching our children to write, read and spell.* You and Your Child's Health. http://www.waldorflibrary.org/images/stories/articles/sjohnsonreadwritespell.pdf

Johnson, J. R. (2015). *The effect of directed sensory-motor activity on attention and independent work skills of second graders*. https://digitalcommons.hamline.edu/hse_all/244

Jones, D. E., Greenberg, M., & Crowley, M. (2015). Early social-emotional functioning and public health: The relationship between kindergarten social competence and future wellness. *American Journal of Public Health*, *105*(11), 2283-2290. https://doi.org/10.2105/AJPH.2015.302630

Joshi, M. N., Vig, D., & Chawala, A. (2021). Family based early predictors of developmental readiness among children. *The Indian Journal of Home Science*, *33*(2), 2. https://www.researchgate.net/publication/353558477

Joshi, N., Vig, D., & Saini, S. (2019). The relationship of socio-personal variables with knowledge of the private school teachers regarding developmental readiness. *International Journal of Educational Science and Research*, *9*(4), 35-42. https://doi.org/10.24247/ijesraug20196

Kagan, D. M. (1992a). Implication of research on teacher belief. *Educational Psychologist*, *27*(1), 65-90. https://doi.org/10.1207/s15326985ep2701_6

Karabulut, H. (2013). The neuro-building blocks of learning: Improving school readiness and overcoming learning difficulties. *Journal of Education and Future*, *4*, 1. https://dergipark.org.tr/en/pub/jef/issue/18636/196695

Katzenellenbogen, G., Franzsen, D., & van der Linde, J. (2021). Postural control in children receiving intervention using the astronaut training protocol. *South African Journal of Occupational Therapy*, *51*(2), 65-73. http://www.scielo.org.za/scielo.php?pid=S2310-38332021000200009&script=sci_arttext&tlng=es

Kaviraja, K. (2021). Proprioception impairment and treatment approaches in pediatrics. *Proprioception.* https://doi.org/10.5772/intechopen.96382

Keen, M. D. (2011). Functional task at school: Handwriting. In J. W. Solomon & J. C. O'Brien (Eds.), *Pediatric skills for occupational therapy assistants* (3rd ed., pp. 414-440). Mosby/Elsevier.

Kentucky Department of Education (2018). *School readiness definition.*
https://education.ky.gov/specialed/earlylearning/Pages/schlrdndfn.aspx

Kielhofner, G. (2009). *Conceptual foundations of occupational therapy practice*. FA
Davis.

Kokkalia, G., Drigas, A., Economou, A., & Roussos, P. (2019). School readiness from
kindergarten to primary school. *International Journal of Emerging Technologies
in Learning*, *14*(11). https://doi.org/10.3991/ijet.v14i11.10090

Koomar, J. A., & Bundy, A. (2002). Creating direct intervention from theory. In S. J.
Lane, E. A. Murray & A.C. Bundy (Eds.), *Sensory integration: Theory and
practice*. F. A. Davis.

Kranowitz, C. S. (2005). *The out-of-sync child* (2nd ed.). Tarcher Perigee

Kranowitz, C. S., & Silver, L. B. (1998). *The out-of-sync child: Recognizing and
coping with sensory integration dysfunction*. Perigee Book.

Kröger, S. (2018). Proprioception 2.0: Novel functions for muscle spindles. *Current
Opinion in Neurology*, *31*(5), 592-598.
https://doi.org/10.1097/WCO.0000000000000590

Krog, S., & Kruger, D. (2011). Movement programmes as a means to learning
readiness. *South African Journal for Research in Sport, Physical Education and
Recreation*, *33*(3), 73-87. https://hdl.handle.net/10520/EJC108962

Lapadat, J. C. (2010). Thematic analysis. In A. J. Mills, G. Durepos, & E. Wiebe
(Eds.), *Encyclopedia of case study research* (Vol. 2, pp. 926-928). Sage.
https://doi.org/10.4135/9781412957397.n342

Leavy, P. (2017). *Research design: Quantitative, qualitative, mixed methods, arts-
based, and community-based participatory research approaches*. Guilford Press.

LeBlanc, C. M. (2018). *"What is readiness?" Examining views of school readiness and prosocial outcomes in children* [Unpublished doctoral dissertation]. Mount Saint Vincent University. http://140.230.24.101:8080/xmlui/bitstream/handle/10587/1930/ChantalLeBlanc MASPThesis2018.pdf?sequence=1&isAllowed=y

Le Roux, J. (2020). *Predictors of school dropout in South Africa: An overview* [Unpublished doctoral dissertation]. University of Kwa-Zulu Natal. https://ukzn-dspace.ukzn.ac.za/bitstream/handle/10413/19280/Le%20Roux_Jurne_2020..pdf?sequence=1&isAllowed=y

Lewington, C. (2020). *Conceptualising the influence of sensopathic-focussed play pedagogy on the young learner* [Unpublished doctoral dissertation]. University of Pretoria. https://repository.up.ac.za/bitstream/handle/2263/80456/Lewington_Conceptuali sing_2020.pdf?sequence=1

Liamputtong, J. (2015). *Focus group methodology: Principles and practice*. Sage. https://dx.doi.org/10.4135/9781473957657

Lincoln, Y. S., & Guba, E. G. (1982). *Establishing dependability and confirmability in naturalistic inquiry through an audit*. https://files.eric.ed.gov/fulltext/ED216019.pdf

Lincoln, Y. S., & Guba, E. G. (*1985). Naturalistic inquiry*. Sage.

Lincoln, Y. S., & Guba, E. G. (2000). The only generalization is: There is no generalisation. In R. Gromm, M. Hammesley & P. Forster (Eds.), *Case study method: Key issues, key texts* (pp. 27-44). Sage.

Lopez, K. A., & Willis, D. G. (2004). Descriptive versus interpretive phenomenology: Their contributions to nursing knowledge. *Qualitative Health Research*, *14*(5), 726-735. *h*ttps://doi.org/10.1177/1049732304263638

Loubser, A. (2015). *Die bydrae van leer-en onderrigsteunmateriaal, onderwysers en die omgewing tot die perseptueel-motoriese gereedmaking van graad R-leerders* [Unpublished doctoral dissertation]. Northwestern University. http://repository.nwu.ac.za/bitstream/handle/10394/15369/Loubser_A_2015.pdf?sequence=1

Loubser, A., Pienaar, A. E., Klopper, A., & Ellis, S. (2016). The effect of a learner-support intervention on perceptual-motor skills of kindergarten learners from deprived environments. *Australasian Journal of Early Childhood*, *41*(1), 54-63. https://doi.org/10.1177/183693911604100108

Louw, D., & Louw, A. (2007). *Child and adolescent development*. Psychology Publishers.

Louw, D., & Louw, A. (2019). *Human development for students in Southern Africa*. UJ Press.

Luborsky, B. (2017). Helping children with attentional challenges in a Montessori classroom: The role of the occupational therapist. *NAMTA Journal*, *42*(2), 287-352. https://files.eric.ed.gov/fulltext/EJ1144540.pdf

Mack, L. (2010). The philosophical underpinnings if educational research. *Polyglossia*, *19*, 5-11. https://secure.apu.ac.jp/rcaps/uploads/fckeditor/publications/polyglossia/Polyglossia_V19_Lindsay.pdf

Macmillan Dictionary (n.d.). *Play a role*. https://www.macmillandictionary.com/dictionary/british/play-a-part-role-in-something

Mailloux, Z., Mulligan, S., Roley, S. S., Blanche, E., Cermak, S., Coleman, G. G., & Lane, C. J. (2011). Verification and clarification of patterns of sensory integrative dysfunction. *The American Journal of Occupational Therapy*, *65*(2), 143-151. https://doi.org/10.5014/ajot.2011.000752

Maree, K. & van der Westhuizen, C. (2007). Planning a research proposal. In K. Maree (Ed.), *First steps in research* (pp. 24-44). Van Schaik.

Marti, M., Melvin, S., Noble, K. G., & Duch, H. (2018). Intervention fidelity of getting ready for school: Associations with classroom and teacher characteristics and preschooler's school readiness skills. *Early Childhood Research Quarterly*, *44,* 55-71. https://doi.org/10.1016/j.ecresq.2018.02.010

May-Benson, T. A., & Schaaf, R. (2015). Ayres Sensory Integration ® Intervention. In I. Söderback (Ed.), *International handbook of occupational therapy interventions* (2nd ed., pp. 633-646). Springer.

McClelland, M. M., & Cameron, C. E. (2012). Self-regulation in early childhood: Improving conceptual clarity and developing ecologically-valid measures. *Child Development Perspectives*, *6*, 136-142. http://dx.doi.org/10.1111/j.1750-8606.2011.00191.x

McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology, 43*(4), 947. https://doi.org/10.1037/0012-1649.43.4.947

McClelland, M. M., & Tominey, S. L. (2015). *Stop, think, act: Integrating self-regulation in the early childhood classroom*. Routledge.

Meisels, S. J. (1998). Assessing readiness. In R. J. Pianta & M. J. Cox (eds.), *The transition to kindergarten* (pp. 39-66). National Center for Early Development And Learning. https://files.eric.ed.gov/fulltext/ED429272.pdf

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.

Meyburgh, C. (2018). *An exploratory investigation into fathers' perspectives of school readiness.* http://etd.uwc.ac.za/bitstream/handle/11394/6419/Meyburgh%20Celeste.pdf?sequence=1&isAllowed=n

Milicev, S., & Vukuvic K. (2017). Proprioception and posture. *SPORT - Science & Practice*, *7*(1), 39-54. http://sportnaukaipraksa.vss.edu.rs/pdf/SNP-07-02_EN/PROPRIOCEPTION%20AND%20POSTURE.pdf

Miles, S. J. (2018). *Sensory and motor interventions for very early school-age children: A cluster pragmatic randomised controlled trial examining effect on development, behaviour and academic learning outcomes* [Unpublished doctoral dissertation]. Australian Catholic University. https://doi.org/10.4226/66/5b0636d4e2186

Miller, L. J., Anzalone, M. E., Lane, S. J., Cermak, S. A., & Osten, E. T. (2007). Concept evolution in sensory integration: A proposed nosology for diagnosis. *The American Journal of Occupational Therapy, 61*(2), 135. https://doi.org/10.5014/ajot.61.2.135

Miller, M. M., & Kehl, L. M. (2019). Comparing parents' and teachers' rank-ordered importance of early school readiness characteristics. *Early Childhood Education Journal, 47*(4), 445-453. https://doi.org/10.1007/s10643-019-00938-4

Millians, M. (2011). Learning readiness. In S. Goldstein & J. A. Naglieri (Eds.), *Encyclopedia of child behavior and development* (pp. 877-879). Springer.

Mix, K. S., & Cheng, Y. L. (2012). The relation between space and math: Developmental and educational implications. *Advances In Child Development and Behavior*, *42*, 197-243. https://doi.org/10.1016/B978-0-12-394388-0.00006-X

Montell, C. (2019). Coordinated movement: watching proprioception unfold. *Current Biology*, *29*(6), R202-R205. https://doi.org/10.1016/j.cub.2019.02.004

Mtati, C. N. (2020). *A systematic review: Instruments that measure emotional and social competency as a domain of school readiness of preschool children in South Africa.* https://etd.uwc.ac.za/bitstream/handle/11394/7668/mtati_m_chs_2020.pdf?sequence=1&isAllowed=y

Mukhles, M. A.-A. (2020.). Linking ontology, epistemology and research methodology. *Science & Philosophy, 8(1), 75-91.* https://doi.org/10.23756/sp.v8i1.500

Mulligan, S. (2014). *Occupational therapy evaluation for children: A pocket guide* (2nd ed.). Wolters Kluwer/Lippincott Williams & Wilkins Health.

Nassaji, H. (2020). Good qualitative research. *Language Teaching Research*, *24*(4), 427-431. https://doi.org/10.1177/1362168820941288

Nathan, T., & Kahaner, M. (n.d.). *Enhancing the underlying skills for learning so improving maths and literacy in primary schools.* https://www.academia.edu/37816588/Enhancing_The_Underlying_Skills_for_Learning_so_Improving_Maths_and_Literacy_in_Primary_Schools?auto=citations&from=cover_page

National Education Goals Panel (1991). *The national education goals report: Building a nation of learners.* U.S. Government Publishing Office. https://babel.hathitrust.org/cgi/pt?id=osu.32435060900495&view=1up&seq=21&q1=physical

National Research Council (2000). *From neurons to neighborhoods: The science of early childhood development.* https://files.eric.ed.gov/fulltext/ED446866.pdf

Nesbitt, K. T., Fuhs, M. W., & Farran, D. C. (2019). Stability and instability in the co-development of mathematics, executive function skills, and visual-motor integration from prekindergarten to first grade. *Early Childhood Research Quarterly*, *46*, 262-274. https://doi.org/10.1016/j.ecresq.2018.02.003

Nieuwenhuis, J. (2007). Introducing qualitative research. In K. Maree (Ed.), *First steps in research* (pp. 47-68). Van Schaik.

Nigar, N. (2020). Hermeneutic phenomenological narrative enquiry: A qualitative study design. *Theory and Practice in Language Studies*, *10*(1), 10-18. https://doi.org/10.17507/tpls.1001.02

Niklas, F., Cohrssen, C., Vidmar, M., Segerer, R., Schmiedeler, S., Galpin, R., & Tayler, C. (2018). Early childhood professionals' perceptions of children's school readiness characteristics in six countries. *International Journal of Educational Research*, *90*, 144-159. https://doi.org/10.1016/j.ijer.2018.06.001

Nisbet, J., & Watt, J. (1984). Case study. In J. Bell, T. Bush, A. Fox, J. Goodey & S. Goulding (Eds.), *Conducting small-scale investigations in educational management* (pp. 79-92). Harper & Row.

Noel, A. M. (2010). Perceptions of school readiness in one Queensland primary school. *Australasian Journal of Early Childhood*, *35*(2), 28-35. https://doi.org/10.1177/183693911003500205

Nzunda, I. E., & Kurniati, E. (2021). Assessing perception and action of parents, teachers, and school leaders on school readiness. A case of Mtwara region-Tanzania. *Prosiding Seminar Nasional & Internasional*. https://jurnal.unimus.ac.id/index.php/psn12012010/article/viewFile/8983/6020

Oberer, N., Gashaj, V., & Roebers, C. M. (2018). Executive functions, visual-motor coordination, physical fitness and academic achievement: Longitudinal relations in typically developing children. *Human Movement Science*, *58*, 69-79. https://doi.org/10.1016/j.humov.2018.01.003

O'Farrelly, C., Booth, A., Tatlow-Golden, M., & Barker, B. (2020). Reconstructing readiness: Young children's priorities for their early school adjustment. *Early Childhood Research Quarterly*, *50*, 3-16. https://doi.org/10.1016/j.ecresq.2018.12.001

Oxford Learner's Dictionary (n.d.). *Preparedness*. https://www.oxfordlearnersdictionaries.com/definition/english/preparedness?q=preparedness

Pagani, L., & Fitzpatrick, C. (2014). Children's school readiness: Implications for eliminating future disparities in health and education. *Health Education & Behavior: The Official Publication of the Society for Public Health Education*, *41*(1), 25-33. https://doi.org/10.1177/1090198113478818

Palys, T. (2008). Purposive sampling. In L. Given (Ed.), *The SAGE handbook of qualitative research methods* (pp. 297-298). Sage.

Pan, Q., Trang, K. T., Love, H. R., & Templin, J. (2019). School readiness profiles and growth in academic achievement. In *Frontiers in education* (p. 127). Frontiers. https://doi.org/10.3389/feduc.2019.00127

Parham, L. D., & Mailloux, Z. (2015). Sensory integration. In J. Case-Smith & J. O'Brien (Eds.), *Occupational therapy for children* (7th ed., pp. 258-303). Elsevier.

Patton, M. Q. (2015). *Qualitative research and evaluation methods* (4th ed.). Sage.

Pears, K. C., Healey, C. V., Fisher, P. A., Braun, D., Gill, C., Conte, H. M., & Ticer, S. (2014). Immediate effects of a program to promote school readiness in low-income children: Results of a pilot study. *Education & Treatment of Children*, *37*(3), 431. https://doi.org/10.1353/etc.2014.0021

Pham, L. (2018). *A Review of key paradigms: Positivism, interpretivism and critical inquiry.* University of Adelaide.

Pheloung, B. (1997). *Help your class to learn: Effective perceptual movement programs for your classroom*. Griffiths Press.

Phillippi, J., & Lauderdale, J. (2018). A guide to field notes for qualitative research: context and conversation. *Qualitative Health Research*, *28*(3), 381-388. https://doi.org/10.1177/1049732317697102

Phothongsunan, S. (2010). *Interpretive paradigm in educational research*. https://repository.au.edu/bitstream/handle/6623004553/13708/galaxy-iele-v2-n1-1-oct-10.pdf

Pienaar, A. E., van Rensburg, E., & Smit, A. (2011). Effect of a kinderkinetics programme on components of children's perceptual-motor and cognitive functioning. *South African Journal for Research in Sport, Physical Education and Recreation*, *33*(3), 113-128. https://hdl.handle.net/10520/EJC108959

Pillay, K. (2018). *The implementation practices of physical education by grade R teachers* [Unpublished doctoral dissertation]. University of Pretoria. https://repository.up.ac.za/bitstream/handle/2263/67872/Pillay_Implementation_2018.pdf?sequence=1

Pitcl, J., Provance, E., & Kerslake, C. A. (2006). *Social and emotional well-being: The foundation for school readiness.* WestEd Center for Prevention and Early Intervention (CPEI). https://www2.wested.org/www-static/online_pubs/cpei/social-emotional.pdf

Prosek, E. A., & Gibson, D. M. (2021). Promoting rigorous research by examining lived experiences: A review of four qualitative traditions. *Journal of Counseling & Development*, *99*(2), 167-177. https://doi.org/10.1002/jcad.12364

Proske, U. (2019). Exercise, fatigue and proprioception: A retrospective. *Experimental Brain Research*, *237*(10), 2447-2459. https://doi.org/10.1007/s00221-019-05634-8

Proske, U., & Gandevia, S. C. (2012). The proprioceptive senses: Their roles in signaling body shape, body position and movement, and muscle force. *Physiological Reviews*, *92*(4), 1651-97. https://doi.org/10.1152/physrev.00048.2011

Quinn, D. M. (2015). Kindergarten black-white test score gaps: Re-examining the roles of socioeconomic status and school quality with new data. *Sociology of Education,* *88*(2), 120-139. https://doi.org/10.1177/0038040715573027 -org.uplib.idm.oclc.org/stable/43743431?seq=1

Quirk, M., Dowdy, E., Goldstein, A., & Carnazzo, K. (2017). School readiness as a longitudinal predictor of social-emotional and reading performance across the elementary grades. *Assessment for Effective Intervention*, *42*(4), 248-253. https://doi.org/10.1177/1534508417719680

Ramsook, L. (2018). A methodological approach to hermeneutic phenomenology. *International Journal of Humanities and Social Sciences*, *10*(1), 14-24. https://www.researchgate.net/publication/323687948

Recoder, L. E. (2019). *Supporting therapy in the classroom: strategies for occupational, speech/language, and physical therapy.* https://educate.bankstreet.edu/cgi/viewcontent.cgi?article=1239&context=independent-studies

Reid, L. D., & Strobino, D. M. (2019). A population-based study of school readiness determinants in a large urban public school district. *Maternal and Child Health Journal*, *23*(3), 325-334. https://doi.org/10.1007/s10995-018-2666-z

Retnawati, H., Kistoro, A., Cahyo, H., & Putranta, H. (2021). School readiness assessment: Study of early childhood educator experience. *Ilkogretim Online*, *20*(1). https://doi.org/10.17051/ilkonline.2021.01.041

Ring, E., Mhic Mhathuna, M., Moloney, M., Hayes, N., Stafford, P., Keegan, S., & Madden, R. (2016). *An examination of concepts of school readiness among parents and educators in Ireland.* https://dspace.mic.ul.ie/bitstream/handle/10395/2344/O'Keeffe,%20A.%20(2016)%20Report?sequence=2

Rittle-Johnson, B., Fyfe, E. R., Hofer, K. G., & Farran, D. C. (2016). Early math trajectories: Low income children's mathematics knowledge from ages 4 to 11. *Child Development*, *88*(5), 1727-1742. https://doi.org/10.1111/cdev.12662

Rittle-Johnson, B., Zippert, E. L., & Boice, K. L. (2019). The roles of patterning and spatial skills in early mathematics development. *Early Childhood Research Quarterly*, *46*, 166-178. https://doi.org/10.1016/j.ecresq.2018.03.006

Roessingh, H., & Bence, M. (2018). Embodied cognition: laying the foundation for early language and literacy learning. *Language and Literacy*, *20*(4), 23-39. https://doi.org/10.20360/langandlit29435

Romero-Ayuso, D., Jorquera-Cabrera, S., Segura-Fragoso, A., Toledano-González, A., Rodriguez-Martinez, M. C., & Triviño-Juárez, J. M. (2018). Assessment of sensory processing and executive functions in childhood: Development, reliability, and validity of the ePYFeI. *Frontiers in Pediatrics*, *6*, 71. https://doi.org/10.3389/fped.2018.00071

Sadeghi, A. (2019). Validation of a social-emotional school readiness scale in Iranian children. *Iranian Evolutionary and Educational Psychology Journal*, *1*(3), 204-212. https://doi.org/10.29252/ieepj.1.3.204

Sadowski, M. (2006). The school readiness gap. *Harvard Education Letter*, *22*(4), 1-2. https://www.fcd-us.org/the-school-readiness-gap/

Samuels, W. E., Tournaki, N., Blackman, S., & Zilinski, C. (2016). Executive functioning predicts academic achievement in middle school: A four-year longitudinal study. *The Journal of Educational Research*, *109*, 478-490. http://dx.doi.org/10.1080/00220671.2014.979913

Sánchez-Lastra, M. A., Varela, S., Cancela, J. M., & Ayán, C. (2019). Improving children's coordination with proprioceptive training. *Apunts Educación Física Y Deportes*, *136*, 22-35. https://doi.org/10.5672/apunts.2014-0983.es.(2019/2).136.02

Saunders, D. (2005). *The importance of sensory processing*. http://dsaundersot.webs.com/The%20Importance%20of%20Sensory%20Processing.pdf

Scharoun, S. M., & Bryden, P. J. (2014). Hand preference, performance abilities, and hand selection in children. *Frontiers in Psychology*, *5*, 82. https://doi.org/10.3389/fpsyg.2014.00082

Seefeldt, V. (1986). *Physical activity & well-being*. American Alliance for Health, Physical Education, Recreation and Dance Publications. https://files.eric.ed.gov/fulltext/ED289874.pdf

Shaari, M. F., & Ahmad, S. S. (2018). Preschool design and school readiness. Asian *Journal of Quality of Life*, *3*(10), 109-120. https://doi.org/10.21834/ajqol.v3i10.106

Sheedy, A. J., Brent, J., Dally, K., Ray, K., & Lane, A. E. (2021). Handwriting readiness among digital native kindergarten students. *Physical & Occupational Therapy in Pediatrics*, 1-15. https://doi.org/10.1080/01942638.2021.1912247

Sherrington, C. (1906). *The integrative action of the nervous system*. https://www.ipnfa.org/wp-content/uploads/2020/08/irradiation-and-reinforcement-sir-charles-s-sherrington-1906.pdf

Skagerlund, K., & Träff, U. (2016). Processing of space, time, and number contributes to mathematical abilities above and beyond domain-general cognitive abilities. *Journal of Experimental Child Psychology*, *143*, 85-101. https://doi.org/10.1016/j.jecp.2015.10.016

Smith, M. L., & Shepard, L. A. (1988). Kindergarten readiness and retention: A qualitative study of teachers' beliefs and practices. *American Educational Research Journal*, *25*(3), 307-333. https://doi.org/10.3102/00028312025003307

Smith, B., Sparkes, A. C., Phoenix, C., & Kirkby, J. (2012). Qualitative research in physical therapy: A critical discussion on mixed-method research. *Physical Therapy Reviews*,*17*(6), 374-381. https://doi.org/10.1179/1743288X12Y.0000000030

Smith Roley, S., & Jacobs, S.E. (2009). Sensory integration. In E. B. Crepeau, E. S. Cohn & B. A. Boyt Schell (Eds.), *Willard & Packman's occupational therapy* (11th ed., pp. 793-817). Lippincott Williams & Wilkins.

South African Council for Educators (2012). *The CPTD management system handbook.* SACE. https://www.sace.org.za/assets/documents/uploads/sace_30373-2016-08-31-CPTD%20Handbook.pdf

Sperling, R. A., & Head, D. M. (2002). Reading attitudes and literacy skills in prekindergarten and kindergarten children. *Early Childhood Education Journal*, *29*(4), 233-236. https://doi.org/10.1023/A:1015129623552

Statistics South Africa (2018). *General household survey 2018.* https://www.statssa.gov.za/publications/P0318/P03182018.pdf

Suggate, S. P., & Martzog, P. (2020). Screen-time influences children's mental imagery performance. *Developmental Science*, *23*(6), e12978. https://doi.org/10.1111/desc.12978

Sutela, M. (2018). *Measuring the integration of sensorimotor information during hand movement.* http://urn.fi/URN:NBN:fi:aalto-201806293915

Suetterlin, K. J., & Sayer, A. A. (2014). Proprioception: Where are we now? A commentary on clinical assessment, changes across the life course, functional implications and future interventions. *Age and Ageing, 43*(3), 313-318. https://doi.org/10.1093/ageing/aft174

Tavassolie, T., López, C., De Feyter, J., Hartman, S., & Winsler, A. (2018). Migrant preschool children's school readiness and early elementary school performance. *Journal of Educational Research, 111*(3), 331-344. https://doi.org/10.1080/00220671.2016.1261074

Taylor, S. J., Bogden, R., & DeVault, M. L. (2016). *Introduction to qualitative research methods: A guidebook and resources* (4th ed.). Wiley.

Taylor, N. (2019). Inequalities in teacher knowledge in South Africa. In N. Spaull & J. Jansen (Eds.), *South African schooling: The enigma of inequality. Policy implications of research in education* (Vol. 10, pp. 263-282). Springer. https://doi.org/10.1007/978-3-030-18811-5_14

Teleková, R., & Marcineková, T. (2020). The emotional-motivational component of school readiness of beginning pupils. *Proceedings of CBU in Social Sciences, 1,* 218-224. https://doi.org/10.12955/pss.v1.76

Thorndike, E. L. (1913). *Educational psychology (Vol. 1). The original nature of man.* Teachers College. https://doi.org/10.1037/13763-000

Todd, T. A. (2018). Proprioception. In J. S. Kreutzer, J. DeLuca & B. Caplan (Eds.). *Encyclopedia of clinical neuropsychology* (2nd ed., pp. 2849-2852). Springer.

Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. Qualitative Inquiry, 16(10), 837-851. https://doi.org/10.1177/1077800410383121

Turnbull, K. L., Mateus, D. M. C., LoCasale-Crouch, J., Coolman, F. L., Hirt, S. E., & Okezie, E. (2022). Family routines and practices that support the school readiness of young children living in poverty. *Early Childhood Research Quarterly, 58,* 1-13. https://doi.org/10.1016/j.ecresq.2021.07.004

Tuthill, J. C., & Azim, E. (2018). Proprioception. *Current Biology*, *28*(5), R194-R203. https://doi.org/10.1016/j.cub.2018.01.064

Vaishnavi, G. (2021). Nomophobia kids and proprioception. In J. A. Vega & J. Cobo (Eds.), *Proprioception* (pp. 114-130). IntechOpen. https://doi.org/10.5772/intechopen.96236

van der Linde, J. (2019). *The development of a screening instrument to identify sensory integration difficulties in children from low socioeconomic environments* [Unpublished doctoral dissertation]. University of the Witwatersrand.

Van Zyl, E. (2011). The relationship between school readiness and school performance in Grade 1 and Grade 4. *South African Journal of Childhood Education*, *1*(1), 82-94. https://files.eric.ed.gov/fulltext/EJ1187411.pdf

van Zyl, E., & van Zyl, E. (2011). A qualitative study looking at the possible influence of stress on school readiness and school performance amongst disadvantaged early learners in South Africa. *South African Education Journal*, *8*(1), 11-18.

van Zyl, E. N. (2016). *A pilot study exploring the effect of an integrated learning therapy home programme together with occupational therapy on child development* [Unpublished doctoral dissertation]. University of the Witwatersrand. https://core.ac.uk/download/pdf/188770043.pdf

Vasquez-Rosati, A., & Cordero-Homad, C. (2021). Proprioceptive perception: An emergence of the interaction of body and language. In J. A. Vega & J. Cobo (Eds.), *Proprioception* (pp. 95-114). IntechOpen. http://dx.doi.org/10.5772/intechopen.95461

Vermaas, S. H. (2010). *Performance skills of Grade 1 learners: Educators' knowledge and attitude* [Unpublished doctoral dissertation]. University of the Free State. https://scholar.ufs.ac.za/bitstream/handle/11660/2157/VermaasSH.pdf?sequenc e=1&isAllowed=y

Walia, R. (2015). A saga of qualitative research. *Social Criminology*, *5*(2), 124. https://doi.org/10.4172/2375-4435.1000124

Walters, C. H. (2001). Assumptions of qualitative research methods. *Perspectives in Learning*, *2*(1), 14. https://csuepress.columbusstate.edu/cgi/viewcontent.cgi?article=1091&context=pil

Wan Yunus, F., Liu, K. P., Bissett, M., & Penkala, S. (2015). Sensory-based intervention for children with behavioral problems: A systematic review. *Journal of Autism and Developmental Disorders*, *45*(11), 3565-3579. https://doi.org/10.1007/s10803-015-2503-9

Watts, R. M. (2021). *A qualitative study with parents and teachers on the impact of COVID-19 on children's school readiness: National and international perspectives* [Unpublished doctoral dissertation]. California State University. https://www.proquest.com/docview/2598945804?pq-origsite=gscholar&fromopenview=true

Welsh, J. A., Nix, R. L., Blair, C., Bierman, K. L., & Nelson, K. E. (2010). The development of cognitive skills and gains in academic school readiness for children from low-income families. *Journal of Educational Psychology*, *102*(1), 43. https://doi.org/10.1037/a0016738

Wernicke, T., & Kalbantner-Wernicke, K. (2016). Fit for school: The samurai school program. *Medical Acupuncture*, *28*(1), 33-39. https://doi.org/10.1089/acu.2015.1147

Widyaning, H., Nurika, E. T., & Christian, O. (2019). School readiness based on social aspects, capabilities and independence. *Proceeding of 2nd International Seminar on Psychology.* http://digital.library.ump.ac.id/269/2/2.%20Full%20Paper_Hapsari%2C%20Trilestari%2C%20Octavianus_UM%20Purworejo%20%28p%2035-46%29.pdf

Winter, S. M., & Kelley, M. F. (2008). Forty years of school readiness research: What have we learned? *Childhood Education*, *84*(5), 260-266. https://doi.org/10.1080/00094056.2008.10523022

Wright, C., Diener, M., & Kay, S. C. (2000). School readiness of low-income children at risk for school failure. *Journal of Children & Poverty*, *6*(2), 99-117. https://doi.org/10.1080/713675961

Yildiz, R., Yildiz, A., Gucuyener, K., Soysal Acar, A. S., & Elbasan, B. (2020). Minor neurological dysfunction in preterm children and its association with school readiness. *International Journal of Disability, Development and Education*, *67*(2), 125-134. https://doi.org/10.1080/1034912X.2019.1614154

Yin, R. K. (2016). *Qualitative research: From start to finish* (2nd ed.). The Guilford Press.

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). Sage.

Yzel, M. (2017). *Teachers' perceptions of the implementation of school readiness assessment instruments* [Unpublished doctoral dissertation]. University of Pretoria. https://repository.up.ac.za/bitstream/handle/2263/62909/Yzel_Teachers_2017.pdf?sequence=1

Zhang, X., Koponen, T., Räsänen, P., Aunola, K., Lerkkanen, M. K., & Nurmi, J. E. (2014). Linguistic and spatial skills predict early arithmetic development via counting sequence knowledge. *Child Development*, *85*(3), 1091-1107. https://doi.org/10.1111/cdev.12173

Zhang, X., & Lin, D. (2015). Pathways to arithmetic: The role of visual-spatial and language skills in written arithmetic, arithmetic word problems, and nonsymbolic arithmetic. *Contemporary Educational Psychology, 41*, 188-197. https://doi.org/10.1016/j.cedpsych.2015.01.005

Zingerevich, C., Greiss-Hess, L., Lemons-Chitwood, K., Harris, S. W., Hessl, D., Cook, K., & Hagerman, R. J. (2009). Motor abilities of children diagnosed with fragile X syndrome with and without autism. *Journal of Intellectual Disability Research*, *53*(1), 11-18. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2614297/pdf/nihms66175.pdf