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RESEARCH DEVELOPMENT
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**DESCRIBING THE PERFORMANCE OF FIVE-YEAR-OLD
CHILDREN ON 11 SUBTESTS OF THE REVISED CLINICAL
OBSERVATIONS BY THE SOUTH AFRICAN INSTITUTE FOR
SENSORY INTEGRATION**

By

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Dissertation submitted in fulfilment of the requirements for the degree

M. Occupational Therapy

(MOTR8900)

in the

DEPARTMENT OF OCCUPATIONAL THERAPY

FACULTY OF HEALTH SCIENCES

UNIVERSITY OF THE FREE STATE

BLOEMFONTEIN

November 2020

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DECLARATION

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30/09/2020

Date

ACKNOWLEDGEMENTS

My sincere thanks to the following:

- To all the parents who took the time to fill in consent forms. Thank you for making my study a reality.
- To all the children who participated in my study: “May the road rise to meet you, may the wind be always at your back, may the sun shine warm on your face; the rain fall soft upon your fields, and until we meet again may God hold you in the palm of his hand”. Traditional Irish Blessing.
- To all the educators who took the time to assist me with the logistical elements of the study.
- My parents, Lynette and Theuns. Thank you for your unending financial, practical and emotional support throughout my studies. Thank you for always believing in the reality of my dreams.
- My study leaders, Elize Janse van Rensburg and Chané Potgieter. I would like to sincerely thank you both for constantly motivating me to put my best foot forward in my studies. You both present yourself with such modesty and grace, regardless of your abundance of success in your work and your studies.
- My sincere thanks go to Mrs Ray-Ann Cook and Dr Annemarie van Jaarsveld, true visionaries and experts in their field. Thank you for being the “rock-stars” of Ayres Sensory Integration® therapy in South Africa.
- To my Biostatistician, Cornel van Rooyen. Thank you for your patience in assisting me with my data capturing and data analysis.
- To the staff at the Life St. Dominic’s Rehabilitation Unit and particularly Carina Basset and Sister Des Cox, thank you for your encouragement and patience throughout my studies and allowing me to complete my studies whilst working at the rehabilitation unit.
- To Hans and Antionette Janse van Rensburg, Riaan and Erika Ahrens and Annette Ahrens. Thank you for offering up your homes and always providing me with a warm bed and a hearty meal, during my many trips

to Bloemfontein. Your support and hospitality were fundamental in the completion of my studies.

- To Alec Ahrens, my best friend. Thank you for your advice, prayers and being my crutch when I needed support. The completion of my studies would not have been possible without you.
- To my brothers, Andries, Johan and Theuns. Thank you for your pragmatic thinking and technical support. You are all brilliant, out of the box thinkers and I am so grateful to call you family.
- To Attie & Jam Jam, my interpreters. Thank you both for being the voices of reasoning and much needed comic relief when we hit speed bumps during data collection. Wishing you only success in the future!
- I cannot thank the University of the Free State and SAISI enough for funding, which eased the financial burden of my studies.
- Thank you to my wonderful language editor, Carrie Theron. I so appreciate you squeezing me in during your maternity leave.
- To my gorgeous Aunt, Arlene Winn and my cousins Declan and Wesley Winn. Thank you for always providing me with an alternative study space when I had cabin fever. Your mouth-watering treats left me well fed and energised to combat my dissertation.

Thank you, God, for all your blessings to me and my family. For strength you give me each day and for all the people around me who make life more meaningful.

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LISTS OF ACRONYMS

CO(s)	Clinical Observation(s)
ASI®	Ayres Sensory Integration®
SID	Sensory Integration Dysfunction
USA	United States of America
SAn	South African
SAISI	South African Institute for Sensory Integration
RCO(s)	Revised Clinical Observations(s)
SH	Should Have
SNH	Should Not Have
UFS	University of the Free State
SIPT	Sensory Integration and Praxis Test
EASI	Evaluation of Ayres Sensory Integration®
AOTA	American Occupational Therapy Association
HPCSA	Health Professions Council of South Africa
BCM	Buffalo City Metro
OTASA	The Occupational Therapy Association of South Africa
EC	Eastern Cape
DoE	Department of Education
HSREC	Health Science Research and Ethics Committee
APA	American Psychological Association
SA	South Africa
CINAHL	Cumulative Index to Nursing and Allied Literature
SCSIT	Southern Californian Sensory Integration Tests
SCPNT	Southern Californian Post-Rotary Nystagmus Tests
WPS	Western Psychological Services
Beery-VMI-6	Beery Buktenica Developmental Test of Visual-Motor Integration, Sixth Edition
DTVP-2	Developmental Test of Visual Perception, second edition
DTVP-3	Developmental Test of Visual Perception, third edition
COMPs	Clinical Observations of Motor and Postural Skills

SOMI-M	Structured Observations of Sensory Motor Integration
ATNR	Asymmetrical Tonic Neck Reflex
STNR	Symmetrical Tonic Neck Reflex
TLR	Tonic Labyrinth Reflex
ADHD	Attention Deficit and Hyperactive Disorder
SIAS	National Strategy on Screening, Identification, Assessment and Support
SES	socio-economic sector
RIP	Reflex Inhibiting Posture
BBH	Bilateral Ball Hitting
TTA	Tactile Touch Accuracy
PJS	Proximal Joint Stability
SM	Slow Movements
ET	Eye Tracking
TLM	Tongue and Lip Movements
J	Jumping
IC	Ideation Challenge
NSOM	Non-Speech Oral Movements

CLARIFICATION OF CONCEPTS

FIVE-YEAR-OLD CHILDREN

Five-year-old children refer to children aged five years six months – five years eleven months, including both genders and children from all socioeconomic backgrounds.

MEASURABLE CHARACTERISTICS

For the purpose of this study *measurable characteristics* refers to quantifiable measurement(s) for example a measurement taken in seconds and/or a number of repetitions in movement patterns.

NON-STANDARDISED ASSESSMENT

Non-Standardised assessment refers to assessment that does not follow clearly defined procedures for administration and scoring. In the scoring of this type of assessment children are not usually compared to a norm to determine if they are developing typically.

OBSERVABLE CHARACTERISTICS

For the purpose of this study *observable characteristics* refer to the manner in which a child executes a task (associated reactions, compensatory movements, pace etc.). Observable characteristics have been divided into three parts, namely general observations, should have parameters and should not have parameters.

PERFORMANCE

For the purpose of this study, *performance* refers to characteristics that can be observed in a motor task that are observable and quantifiable.

REVISED CLINICAL OBSERVATIONS

The *Revised Clinical Observations* is a revision of the 2005 version of Clinical Observations by the South African Institute for Sensory Integration (SAISI). It is a non-standardised assessment. It is based on the original observations by A.J. Ayres which assesses soft neurological signs in the child.

THERAPIST

In the context of this study the term *therapist* denotes to paediatric occupational therapy or a paediatric occupational therapist. Paediatric occupational therapists provide a service to children between the ages of 0-18 years. The focus of the profession is to facilitate children to participate in activities when they experience barriers, which hinder their participation in a given activity (National Health Service, 2017).

ABSTRACT

Key terms: Revised Clinical Observations, five-year-old, Ayres Sensory Integration®, assessment, five-year-old, South African children, occupational therapy

Introduction:

The Clinical Observations (COs) are a battery of 30 observations developed according to the constructs of Ayres Sensory Integration® (ASI®). The observations measure how children can do different body movements and see whether these movements are completed appropriately for their age. The COs are often used together with standardised assessments, to help occupational therapists determine whether or not children present with Sensory Integration Dysfunction (SID). The COs were developed more than a decade ago, and remain popular due to its time efficiency and being inexpensive. It is a non-standardised assessment, and often the only assessment instrument at the disposal of occupational therapists working in resource-constrained settings.

Purpose:

In the current version of the COs interpretation is done by comparing performance to norms from the United States of America (USA). Some efforts have been made to describe performance of South African (SAn) children on certain subtests of the COs, however, not all the subtests have been investigated.

The South African Institute for Sensory Integration (SAISI) is aware of the significance of the COs in South Africa (SA) for the identification of SID. They are also aware of the limitations of the assessment and the need for it to remain relevant. In 2016, SAISI set out to revise the COs so that they could maintain its clinical relevance. The Revision of the Clinical Observations (RCOs) is still

under development and to the researcher's knowledge none of the newly added subtests have been piloted.

It is necessary to describe the performance of SAn children on subtests of the COs, not already investigated, in order to establish what the performance of typically developing South African children on these subtests look like.

The purpose of the study was to describe the performance of five-year-old children from the Buffalo City Metro on 11 subtests of the RCOs by SAISI.

Methodology:

This is a quantitative, descriptive and analytical, cross sectional study. The participants consisted of 104, five-year-old children in the Buffalo City Metro, situated in the Eastern Cape, South Africa. Participants were selected in proportion with the gender and socioeconomic background of the area. Data was collected by means of data collection form based on the RCOs by SAISI (2016). The data collection form was used to record the performance of participants in 11 subtests of the RCOs. Performance characteristics were divided into measurable and observable characteristics. Measurable characteristics referred to observations which were quantifiable such as grade scoring and time taken to perform a task. Observable characteristics were structured observations determined before the data collection period and were divided into Should Have (SH) parameters and Should Not Have (SNH) parameters. SH parameters are characteristics which are favourable and indicate that a participant is performing well. SNH parameters are unfavourable characteristics and indicate that a participant experiences difficulty.

The results were analysed by the Department of Biostatistics at the University of the Free State (UFS).

Results:

Results demonstrate that for most subtests' children performed in accordance to available development norms. Children did however perform below the expected norms in some of the subtests. Few gender differences were identified in the performance of the investigated subtests. This indicates that boys and girls perform similarly in most of these subtests.

Conclusion:

The performance of SAn children in 11 subtests of the RCOs has been investigated. More research should however be completed to determine how SAn children perform in the remainder of the subtests. A collective picture of how SAn children perform in all the subtests of the RCOs will better equip therapists to test children more accurately with this tool.

Word Count: 594

CHAPTER 1:

INTRODUCTION & ORIENTATION TO RESEARCH

1.1. INTRODUCTION

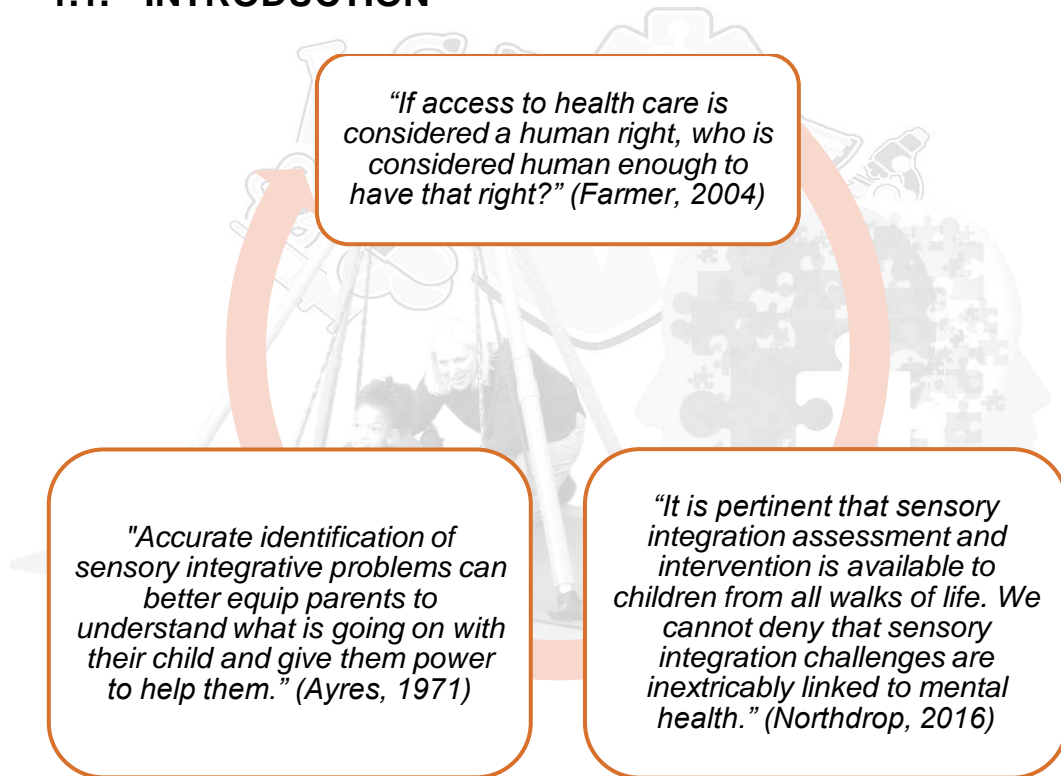


Figure 1. 1 Introduction

Thorough evaluation of the child's sensory-motor function is imperative to ensure accurate goal setting and intervention within the field of Ayres Sensory Integration (ASI®) (Van Jaarsveld, Mailloux, Smith Roley & Raubenheimer, 2014, p.2; Mailloux, Parham, Smith Roley, Ruzzano & Schaaf, 2018, p.1). ASI® is a specialised field within occupational therapy, developed by the renowned Dr A. Jean Ayres and trademarked to differentiate it from other forms of sensory-motor intervention (Schaaf & Mailloux, 2015, p.xvii). Ayres recognised the importance of comprehensive assessment and went on to develop the Sensory Integration and Praxis Test (SIPT) (Van Jaarsveld, Mailloux & Herzberg, 2012, p. 12). Researchers have referred to the SIPT as the gold standard sensory integration assessment because of its strong validity and reliability (Mailloux, Parham, Smith Roley, Ruzzano & Schaaf, 2018, p.2). Ayres recommended that therapists complete Clinical Observations (COs) supplemental to the SIPT to provide comprehensive results that measure the

child's performance so that focused intervention can take place (Ayres, 1989; Schaaf & Mailloux, 2015, p.61).

In the South African (SAn) setting there is a disparity between the public and the private sector, whereby most ASI[®] qualified therapists belong to the private sector (South African Institute for Sensory Integration, 2014). The few ASI[®] qualified therapists in the public sector experience dire financial constraints which result in them omitting the use of expensive assessments such as the SIPT and using more affordable options, so that therapists gain some insight into the child's sensory function. Such an assessment is the clinical observations (COs) (Van Jaarsveld, 2018, p.3). The COs is an assessment compiled by local therapists, but based on norms from the United States of America (USA) collected over two decades ago (SAISI, 2005). Limited research is available to conclude whether the American norms used to score the COs are fair to use on SAn children. Several studies however imply that SAn children develop differently to their American counterparts (Van Jaarsveld, Mailloux & Herzberg, 2012, p.17; Smith, Visser, Van Heerden & Raubenheimer, 2018, p.58). The COs does not provide performance indicators for all its sub-items, nor are the age ranges provided as expansive as the SIPT (Schaaf & Mailloux, 2015, p.62; Van Jaarsveld, Mailloux & Herzberg, 2012, p.14). Researchers have sought to overcome the need for a more accessible, psychometrically sound ASI[®] assessments, by developing tools such as the South African Sensory Integration Screening Instrument and the Evaluation for Ayres Sensory Integration (EASI) (SAISI, 2018; Mailloux, Parham, Smith Roley, Ruzzano & Schaaf, 2018, p.2). Although these assessments show potential for future use, the COs remains popular (Janse Van Rensburg et al., 2017). Omitting the SIPT and using the COs in isolation, can cause inaccurate identification of children with SID because it may not reflect developmental trends in the current-day, SAn setting. Children in financially constrained areas are thus more at risk of not receiving formal ASI[®] assessment and intervention. This may negatively impact their occupational performance in academic tasks.

Five-year-old children attending public schools took part in this study. An undergraduate study by Janse Van Rensburg et al. (2017) found that grade R

learners, comprise, of the large majority of SAn therapist's caseload. Van der Linde (2019) suggests that therapists should identify children with SID before they enter formal schooling to prevent possible development of barriers which may hinder learning. Children who come from underprivileged backgrounds are, however, often only identified between their first and second grade (between the ages of 6 and 7). The current format of the COs doesn't differentiate between atypical and typical behaviour (SAISI, 2005). Identification of atypical behaviour in five-year-old children can better support early intervention in the public healthcare sector. Potgieter (2018, pp.84-152) has already begun this endeavour and has described performance indicators for 10 subtests of the COs. A comparison between the performance of boys and girls has further expanded this study. Studies show that boys and girls develop differently, observations should thus not only correlate with age, but additionally describe which behaviours differentiate according to gender (Smith, Visser, Van Heerden & Raubenheimer, 2018, p.58; Coallier, Rouleau, Bara & Morin, 2014, p.4; Bruininks and Bruininks, 2005).

The research and training committee for the South African Institute for Sensory Integration (SAISI) are cognisant that the COs is not without limitation and have sought to begin its revision. The committee has proposed new subtests, which they hope to add to the Revised COs (RCOs) to increase its variety and value. A pilot of the newly added subtests has not yet occurred, nor have the committee delineated specific observations for each subtest. There is a need to further investigate the ongoing use of the current COs and the future use of the RCOs.

1.2. PROBLEM STATEMENT

The American Occupational Therapy Association (AOTA) (AOTA, 2016, pp.1-7), warns therapists against using outdated assessments and state that therapists have a responsibility to critically appraise assessments to determine their relevance. The Health Professions Council of South Africa (HPCSA) (HPCSA, 2008, p.2), further state that the best way to act in the interest of

patients is to use assessments which have supporting studies that indicate whether they are fair and just for use.

The predicament is that the current format of the COs is outdated, ambiguous and normed on children outside of SA. This negatively impacts the ability of the COs to accurately identify atypical sensory-motor problems in the five-year-old child. Whilst SAISI have sought to revise the COs, the newly added subtests have not yet been piloted and clearly delineated guidelines for administration are not available for these items.

To address this problem the researcher investigated the performance of five-year-old children on 11 subtests of the RCOs. Financial and time constraints limited the study to 11 subtests.

1.3. RESEARCH QUESTION

How do five-year-old children perform on 11 subtests of the Revised Clinical Observations by SAISI?

1.4. PRIMARY GOAL/ AIM & OBJECTIVES

The purpose of the study will now be illustrated by stating the studies aims and objectives.

1.4.1. Aim

The aim of the study was to describe the performance of typically developing children aged five-years and six months to five-years and eleven months, from the Buffalo City Metro, on 11 subtests of the revised Clinical Observations by SAISI.

1.4.2. Objectives

In order to achieve the main aim, the following objectives were identified:

- To describe the measurable characteristics of five-year-old South African children in eleven subtests of the revised Clinical Observations by SAISI.
- To describe the observable characteristics of five-year-old South African children in eleven subtests of the revised Clinical Observations by SAISI.
- To compare differences between the performance of five-year-old South African girls and boys on their performance on eleven subtests of the revised Clinical Observations by SAISI.

1.5. SCOPE OF THE STUDY

The study population consisted of children between the age of five-years and six months and five-years and eleven months. Children attended Grade R in the Buffalo City Metro (BCM). Although the study sample was limited to 104 children the researcher sought to try and ensure that the sample was representative of typical SAn child attending grade R. To do this the researcher ensured that the socio-economic setting of participants was in line with that of the SAn population; thus, dividing participants into those of a lower and a higher socioeconomic sector, in accordance to the real SAn population distribution.

Due to limited time and financial constraints the researcher was unable to extend the size of the study sample.

1.6. METHODOLOGY

The researcher adopted a quantitative, descriptive and analytical, cross sectional study design. Descriptive studies aim to describe a specific phenomenon in a given period of time. This study design was appropriate as the researcher described the performance of five-year-old children in 11 subtests of the RCOs, for across a period of four months of 2019, only. Performance referred to measurable characteristics and observable characteristics. Based on the prevalence of these observations and

characteristics, the researcher was able to identify indicators of typical development in the five-year-old child. A total of 104 children participated in this study, of which 50 were boys and 54 were girls. Children selected to participate in the study followed the socioeconomic trend of the BCM.

An analytical cross-sectional component was included, to enable the researcher to draw a comparison in the performance of boys and girls, by specifically analysing their grade scoring in each subtest.

The researcher provides the reader with more insight of the study methodology in Chapter 3.

1.7. IMPORTANCE AND VALUE OF THE STUDY

The study aims to better describe the performance of five-year-old children in 11 subtests of the RCOs by SAISI (2016). The study hopes to expand on current literature available on the Clinical Observations by SAISI (2005) in order to increase the evidence base of the non-standardised assessment.

1.8. ETHICAL CONSIDERATIONS

The researcher followed strict ethical guidelines provide by the Health HPCSA, the University of the Free State (UFS) and the Occupational Therapy Association of South Africa (OTASA).

The researcher obtained written consent from the Eastern Cape (EC) Department of Education (DoE) to perform the study on DoE schools situated in the Buffalo City Metro.

The researcher obtained approval from the Health Science Research and Ethics Committee (HSREC) on the 07/02/2020. See appendix 15 for details. Written consent from all schools participating in the study was obtained. Only children whose parents consented to their participation in the study were

considered. Lastly, all children who participated in the study gave written assent.

1.9. STYLE OF REFERENCING & OUTLINE OF CHAPTERS

The American Psychological Association (APA) referencing was applied to this study (APA, 2010). Referencing was manually inputted. APA provides the reader with quick intext references to the author, date of publication and page numbers.

This dissertation is made up of six chapters. A brief description of each chapter can be found below:

Chapter 1- Introduction and Orientation to the Study:

This chapter provides a concise delineation of the study and rationale that supports the study. Gaps in literature are also identified. Furthermore, the aims and objectives of the study are stated in this chapter. The researcher briefly touches on the methodology and ethical considerations relevant to this study. These topics are however discussed in more details under Chapter 3.

Chapter 2- Literature Review:

The literature review provides a conceptual and theoretical background for the study. This review briefly explores the history of ASI® and ASI® assessment. It then delves into the context and use of formal and informal ASI® assessment in South Africa (SA). The chapter ends with a historical overview of the Clinical Observations by SAISI (2005) and a review of each subtest included in this study, which informed the administration, observations and scoring procedures used in the data collection phase of this study. Published and edited books were reviewed in conjunction with the following electronic data bases: Cumulative Index to Nursing and Allied Literature (CINAHL®), EBSCO host®, Google Scholar, MEDLINE, OTseeker and Pubmed, to retrieve literature cited in the study. Research consulted date from 2010 to 2020, except for literature of historical significance.

Chapter 3- Research Methodology:

This chapter provides detail regarding the method in which the study was conducted (Duquesne University, 2006, p.3). This chapter aims to provide enough detail so that this study can be easily and accurately replicated. The sections discussed in this chapter are the study approach and design, population and sampling, the pilot study, measurement instrument, data collection and measurement procedures, data analysis, error of measurement and ethical considerations.

Chapter 4- Presentation of Results:

The results of the study are presented in this chapter by means of descriptive statistics. Results for each of the 11 subtests of the revised COs are presented.

Chapter 5- Discussion of Results:

In this chapter the researcher interprets the results of the study provided in chapter 4, in order to give meaning to the study.

Chapter 6- Conclusions and Recommendations:

In this chapter the researcher draws a conclusion for the reader to understand how the study can impact practise. This chapter also provides recommendations for future research. Furthermore, the limitations of the study are listed. The chapter is rounded off with an overall conclusion of the entire study.

1.10. Summary

This chapter provided the reader with a background of the study and rationale that supported the commencement of the study. The researcher also gave the reader a brief idea of the method used to conduct the study.

The upcoming chapter systematically reviews literature which forms the foundation for the study and provides a historical context of the COs.

CHAPTER 2:

LITERATURE REVIEW

Chapter one outlines the purpose and value of the study. Chapter two will allow the reader to consult available literature pertaining to the research topic.

This literature review aims to identify and summarise research relevant to the research topic in order to convey the research problem, the objectives and to support the rationale for the study (Strydom & Delport, 2011, p.288).

The literature review consists of the following five sections, depicted in Figure 2.1.

2.1. Ayres Sensory Integration®

- 2.1.1. The History of Ayres Sensory Integration®
- 2.1.2. Controversial opinions about Ayres Sensory Integration®
- 2.1.3. Ayres Sensory Integration® Intervention in the South African context

2.2. Evaluation in paediatric occupational therapy

- 2.2.1. Delineating Evaluation
- 2.2.2. Assessment and common assessment practices
- 2.2.3. Developmental progression of the five-year-old child
- 2.2.4. Differences in the performance of boys and girls in Assessment

2.3. Categories of Sensory Integration Assessment

- 2.3.1. Formal Sensory Integration Assessment
- 2.3.2. Informal Assessments, using ASI® constructs

2.4. Clinical Observations by SAISI

- 2.4.1. An introduction to the Clinical Observations
- 2.4.2. A brief historical overview of the Clinical Observations
- 2.4.3. A detailed investigation of 11 Clinical Observations subtests that will be the subject of this study
- 2.4.4. The method of selecting should and should not have parameters for the measurement instrument

2.5. Conclusion

Figure 2. 1 A summary of the content of the literature study

2.1.AYRES SENSORY INTEGRATION®

Clinical Observations (COs) in paediatric practice were developed from Ayres Sensory Integration® (ASI®) literature. The following section delineates the history and controversial elements of ASI®.

2.1.1. The history of Ayres Sensory Integration®

Dr. A. Jean. Ayres, a pioneer of her time, coined the theory of sensory integration (Schaaf & Mailloux, 2015, p.33; Van Jaarsveld, 2014, p.295). Ayres' COs of children with learning disabilities prompted her inquisition. She noted that children with learning disabilities, presented with perceptual, motor and sensory difficulties (Schaaf & Miller, 2005, p.143). Ayres developed her theory over four decades (Van Jaarsveld, 2014, p.295). Ayres gave credit to the eminent neuroscientist C.S. Sherrington for conceptualising the theory of sensory integration, but expanded on his work so that therapists could apply the theory to practise (Gorman & Kashani, 2017, p.112).

Ayres developed a series of individual subtests, published as the Southern California Integration Tests (SCSIT) and the Southern California Post-rotary and Nystagmus Tests (SCPNT) (Ayres, 1972, 1980). The assessments fell under criticism because of apprehensions about their reliability and discussion about the validity of generalising such small sample sizes. Although, therapists continued to use these assessments widely (Mailloux, 1990, p.589).

In the 1970s Sensory Integration received recognition within the field of occupational Therapy (Arluke, 1991, p.180). In 1971 the American Occupational Therapy Association (AOTA) recognised sensory integration for the first time (AOTA, 1979).

Early in the 1980s, Ayres collaborated with Sensory Integration International in Torrance and Rush University in Chicago. They coordinated reliability and validity studies and collected normative data on the SCSIT and the SCPNT. Publication of an entirely new assessment occurred. In 1989, Western Psychological Services (WPS) published the Sensory Integration and Praxis

Tests (SIPT) (Ayres, 2004; Mailloux, 1990, p.589). The wide use of the SIPT still occurs in the current day. It remains one of the most rigorously researched and scientifically supported sensory integrative assessments (Bundy, Lane & Murray, 2002; Schaaf & Smith Roley, 2006).

In the present day ASI® is widely recognised and respected by therapists worldwide. Mailloux & Smith-Roley (2010) identified that in the United States of America (USA) as many as 95% of paediatric therapists used constructs of ASI®. Although widely used, there are conflicting views about the efficacy of ASI®. The researcher will explore these views to better understand the relevance and scientific rigour of ASI® in the modern day.

2.1.2. Controversial options of Ayres Sensory Integration®

ASI® has been the subject of ongoing controversy because of reported character flaws in the methodological quality of sensory integrative research (Leong, Carter & Stephenson, 2014, pp. 183-206; Hyatt, Stephenson & Carter, 2009, p.319, Carter & Stephenson, 2014, p.201).

A counter-argument proposes that evidence reviews of the efficiency of Sensory Integration Therapy are conflicting and inconclusive (Schaaf & Nightlinger, 2007, p.240). Reviews include studies dubbed as Ayres Sensory Integration®, which puts into question the reliability of these reviews. Sensory interventions described in some reviews are not in line with the work of Ayres as they do not make use of the core concepts and principles of ASI® (Schaaf & Mailloux, 2015, p.9).

Professional concerns about the integrity of Sensory Integration therapy has led to the Baker/Ayres Trust trademarking Sensory Integration Therapy under the term Ayres Sensory Integration Therapy® (ASI®) (Smith Roley, Mailloux, Miller-Kuhaneck & Glennon, 2007, p. CE-2; Schaaf & Mailloux, 2015, p.xviii).

Although trademarked, confusion and lack of clarity of terms within ASI® remain problematic. ASI® is an evolving theory. The establishment of

uniformity of concepts has not yet occurred (Smith Roley, Mailloux, Miller-Kuhaneck &, Glennon, 2007, p. CE-5).

To conclude, the categorisation of assessments as ASI[®] specific can only occur when assessments include all the constructs specified by the Baker/Ayres trust (Mailloux, Parham, Smith Roley, Ruzzano & Schaaf, 2018, p.2).

The researcher endeavours to explore ASI[®] assessment in more detail, but before this can be done procedures for evaluation must be first be explained. This will allow the reader to better understand how assessment forms part of evaluation. The reader will also better understand factors which should be considered in paediatric assessment such as the age and gender of the child.

2.1.3. Ayres Sensory Integration[®] Intervention in the South African context

Therapists are required to complete four courses presented by the South African Institute for Sensory Integration (SAISI), before they are eligible to provide ASI[®] evaluation and intervention (SAISI, 2020).

The courses offered by SAISI are in line with international standards to ensure that services provided by SAn therapists are of the utmost standard (SAISI, 2020). For a therapist to qualify in ASI[®] the total costs run at about R41270,00 (SAISI, 2020). This does not include travel expenses and accommodation. In addition, the cost of courses inflates yearly. In the SAn setting many therapists do not have the financial means to obtain a qualification in sensory integration. This had resulted in a disproportion between the qualification of public and private therapists (Van Jaarsveld, 2018, p.2). Statistics indicate that 70% of therapists qualified in sensory integration are from the private sector, with only 12% of therapists working in the public sector (South African Institute for Sensory Integration, 2014). Children from the public sector are thus far less likely to receive sensory integration intervention, which is concerning, considering that a study by Van Jaarsveld (2010, pp.8-13) indicated that

children from a lower-socioeconomic class are more susceptible to presenting with SID.

2.2.EVALUATION IN PAEDIATRIC OCCUPATIONAL THERAPY

Evaluation is the very first step of the occupational therapy process (AOTA, 2014, p.S10). It begins during the initial interaction between the occupational therapist and the child and continues during all follow-up sessions with the child (AOTA, 2014, p.S10).

2.2.1. Delineating Evaluation

Evaluation is the process of obtaining and interpreting information about the child. Evaluation enables the therapist to strategize intervention goals and approaches tailored to the child's daily needs (AOTA 2014, p.9; World Federation of Occupational Therapists, 2016; AOTA, 2018, p. CE-2). Evaluation within occupational therapy may differ according to the practice setting, but the purpose remains the same.

2.2.2. Assessment and common assessment practice

Assessments are the specific tools, measures, instruments and resources used in the evaluation process (HPCSA, 2018, p.1). During assessment therapists perform skilled observations, which Dunn (2000) describes as an essential part of successful assessment.

Therapists make use of formal and informal assessments in the evaluation process. Standardised assessments are included under the term *formal assessments* and are designed for a specific purpose in a given population (Cole, Finch, Gowend & Mayo, 1995, p.22). A standardised assessment is a measurement tool that stipulates a uniform and unchanging instruction for test administration and scoring. This limits variations when the assessment is used by different therapists at different points in time, thereby increasing the reliability of assessment (Cole, Gowend Finch, & Mayo., 1995, p.22). In recent years there has been a surge in promoting evidence-based practice in occupational therapy. In light of this the use of standardised tests has been

encouraged because they are reliable, valid and enable measurement of treatment outcomes (Fawcett, 2007, p.23).

Non-formal assessments are those assessments which have not been standardised and are thus not compared to a norm or a criterion (Fawcett, 2007, p.154). These assessments are informally developed by an institution or an individual therapist. In this type of assessment, the performance of the child is judged against the therapist's testing and treatment experience. The results and interpretation of non-standardised assessments are thus open to interpretation, which causes them to be subjective (Fawcett, 2007, p.25). Another limitation is that the assessment administration and scoring is seldom specified which causes poor reliability of assessment (Stewart, 1999; Fawcett, 2007, p.23)

Rich data can be collected from both standardised and non-standardised assessments and synthesized in order to hypothesise which factors facilitate or hamper the child's occupational performance. (AOTA, 2014, p.S41) The therapist can use this data to develop and scale goals specifically for the child (AOTA, 2014, p.S41; Schaaf & Mailloux, 2015, p.38).

Paediatric therapists need to understand the developmental progression of the child to interpret occupational therapy assessments. ASI[®] theory categorises the developmental process as one of its core concepts (Schaaf & Mailloux, 2015, p.7).

2.2.3. Developmental progression of the five-year-old child

The focus of this study is the developmental progression of the five-year-old child. Table 2.1 outlines the typical developmental progression of the five-year old child.

Table 2. 1 Sensory Motor Development of the five-year-old child (Wittenberg, 2009, p.37; Case-Smith, 2010, p.74; Louw & Louw, 2014, p.186).

Developmental Milestones at 60-72 Months	
<p>Sensory-Motor:</p> <ul style="list-style-type: none"> • Walks easily on a narrow line • Can hop on each foot separately and able to do so over distances • Able to stand on one foot for 8-10 seconds • Able to skip without losing their balance • Catches a ball with two hands • Kicks accurately 	<p>Fine Motor:</p> <ul style="list-style-type: none"> • Able to copy a square and a triangle • Draws a man with multiple features • Cuts with scissors • Traces a diamond • Traces letters-begins to copy letters • More accurate bilateral hand use
<p>Social:</p> <ul style="list-style-type: none"> • Has friends of the same sex • Chooses own friends • Plays in groups of 2-4 • Enjoys singing and dancing • Able to reveal their feelings to others 	<p>Occupations:</p> <p><i>Activities of Daily living</i></p> <ul style="list-style-type: none"> • Uses a knife and a fork competently • Undresses and dresses alone <p><i>Play</i></p> <ul style="list-style-type: none"> • Performs organised play in groups • Plays ball sports • Able to perform dramatic play with the emphasis on reality and real-world situations • Plays games with rules such as board games
<p>Cognition:</p> <ul style="list-style-type: none"> • Able to solve concrete problems • Able to sort objects • Able to copy elaborate block structures 	<p>Emotional:</p> <ul style="list-style-type: none"> • Children have expected fears at this age of animals, the dark, bad people and separation from parents • Increasing awareness of their own and other people's feelings

Typical development follows a predictable pattern, but developmental differences occur between boys and girls which can complicate interpretation of assessments. The researcher will discuss this point in the next subheading.

2.2.4. Differences in the performance of boys and girls in Assessment

Researchers have conducted several studies investigating both cognitive and motor developmental differences between boys and girls. Therapists should investigate developmental differences between boys and girls, although this is not always a common practise.

International studies show gender differences between boys and girls in assessments. Coallier, Rouleau, Bara & Morin (2014, p.4) found a significant difference in performance of Canadian boys and girls on the Beery Buktenica Developmental Test of Visual-Motor Integration, Sixth Edition (Beery-VMI-6).

The researcher could also find local studies, which showed gender differences between boys and girls in assessment. Studies found that gender differences occurred between the performance of South African (SAn) children in some subtests of the Developmental Test of Visual Perception, second edition (DTVP- 2), Developmental Tests of Visual Perception, third edition (DTVP-3) and the Beery-VMI-6 (Smith, Visser, Van Heerden & Raubenheimer, 2018, p.58; Visser & Nel, 2018, p.31). Limited research is available on gender differences in ASI® assessments.

Literature poses the following question: should assessments include gender specific norms? Assessment manuals specify gender differences in some assessments such as the BOT-2. Researchers found that girls performed better than boys in subtests which assessed manual dexterity, fine motor integration and fine motor precision (Bruininks and Bruininks, 2005).

Developmental differences between girls and boys exist, this identifies the need to compare performance of boys and girls when establishing assessment norms.

In this study the researcher will draw a comparison in performance of boys and girls in the 11 subtests of the revised COs.

The next point of discussion borrows concepts from section one and identifies specific assessments used in sensory integration therapy.

2.3.CATEGORIES OF SENSORY INTEGRATION ASSESSMENTS

2.3.1. Formal Sensory Integration Assessments

Therapists have access to a variety of formal sensory integration assessments. The SIPT is, however the premier choice within ASI® assessment. The SIPT has been standardised on approximately 2000 children between the ages of 4 years 0 months and 8 years 11 months (Ayres, 2005, p.142; Asher, Parham & Knox, 2008, p.308; Mailloux, Parham, Smith Roley,

Ruzzano & Schaaf, 2018, p.1). The assessment has evolved from the work of Ayres and is one of the most psychometrically sound sensory integration assessments to have emerged (Mailloux, 1990, p.589; Ayres, 1989). Mailloux, Parham, Smith Rolley, Ruzzano and Schaaf (2018) referred to the SIPT as the only assessment that has all the core concepts of ASI®.

The SIPT was not always practical to use in the SAn setting. Previously the SIPT needed to be mailed to WPS, Los Angeles, USA for computerised scoring. In recent years, WPS published a computer program for scoring. SAn therapists can now complete computerised scoring on their personal computers. This has resulted in less time-consuming interpretation of SIPT results and has reduced the cost of test interpretation (Van Jaarsveld, Mailloux & Herzberg, 2012, p.12).

Although interpreting the SIPT is more affordable the cost of administering the SIPT is still exorbitantly high, ranging in the vicinity of R600,00-R700,00 per client (depending on the exchange rate) (Western Psychological Services, 2020). The astronomical cost of implementing the SIPT, makes it unaffordable for the majority of SAn therapists. Another significant limitation is that the SIPT only applies to children between the ages of 4 years and 8 years,11 months.

Many SAn therapists have poor access to electronic scoring programs and there is no availability of kits translated into native SAn languages (Jorquera-Cabrera, Romero Ayuso, Rodriguez-Gil & Trivino-Juarez, 2017, p.4; Mailloux, Parham, Smith Roley, Ruzzano & Schaaf, 2018, p.2). Further, Van Jaarsveld, Mailloux & Herzberg (2012) identified that 12 of the 17 subtests of the SIPT are appropriate to score on SAn children using American norms. However, when comparing the performance of SAn children to that of the standardisation sample, there was a moderate effect size indicating a difference in performance requiring an adaptation of 0.5 standard deviations to the negative side to the scores of SAn children on the following five subtests: Design Copying, Oral Praxis, Bilateral Motor Coordination, Standing and Walking Balance and Motor Accuracy (Van Jaarsveld, Mailloux & Herzberg, 2012, p.17). Another pressing concern is that the assessment norms of the SIPT

may no longer be valid as they were collected 30 years ago (Mailloux, Parham, Smith Roley, Ruzzano & Schaaf, 2018, p.2).

Therapists infrequently use the SIPT in isolation. Jorquera-Cabera et.al. (2017) identified that the SIPT, the sensory profile and the sensory profile measure are the most frequently used assessments for ASI®. The researcher has tabulated other formal ASI® assessments typically used by SAn therapists in collaboration with the SIPT in table 2.2.

Table 2. 2 Sensory Integration Assessments (Jorquera-Cabrera, Romero Ayuso, Rodriguez-Gil & Trivino-Juarez, 2017, pp.7-11; Schaaf & Mailloux, 2015, pp.70-73)

Assessment	Age Range	Cost in SAn Rands for Kit (R15.15 SAn Rand to the Dollar)	Cost in SAn Rands for Form(s)- for one child only (R15.15 SAn Rand to the Dollar)	Language(s) available
		Costs obtained on the 24/01/2021 and the 28/01/2021		
1. Sensory Integration and Praxis Test (SIPT)	4-8 years 11 months	R21759.31	R620.00	English
2. DeGangi-Berk Test of Sensory Integration	3-5 years	R4409.98	R34.10	English
3. The Miller Assessment for Pre-schoolers (MAP)	2 years 9 months-5 years 8 months	R1590.20	R0.00	English, Japanese and Hebrew
4. Test of Ideational Praxis (TIP)	5-8 years	Unknown	Unknown	English
5. Pediatric Clinical Test of Sensory Interaction for Balance (CTSIB)	Over 6 years	Free	No additional cost	English
6. Preschool Imitation and Praxis Scale (PIPS)	1-4 years	Unknown	Unknown	English
7. Sensory Processing measure (SPM); School and Home kit	5-12 years	R4427.98	R132.84	English, Danish, Finnish and Swedish
8. Sensory Profile 2	<ul style="list-style-type: none"> School Companion: 3-14 years and 11 months Child Sensory Profile: 3-14 	R4535.76	R35.16	English and Spanish

	years and 11 months <ul style="list-style-type: none"> • Toddler Sensory Profile: 7-35 months • Infant Sensory Profile: Birth- 6months 			
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It is significant to note that most of the assessments in Table 2.2. are standardised on American children and are only available in English (Jorquera-Cabrera, Romero-Ayuso, Rodriguez-Gil & Trivino-Juarez, 2017, p.1-2). The same is true for the SIPT. Furthermore, none of the aforementioned assessments are available in native SAn languages such as Afrikaans and isiXhosa (Jorquera-Cabrera, Romero-Ayuso, Rodriguez-Gil & Trivino-Juarez, 2017, p.1-2).

International communities have confirmed that the SIPT has several limitations which have hindered its universal implementation in practice. To combat these challenges, American therapists Mailloux, Smith Roley & Parham (2018) proposed the design of a new assessment. This ignited development of Evaluation of Ayres Sensory Integration® (EASI), intending to create an internationally accessible assessment that is comprehensive, inexpensive, electronically accessible, available to a wide age range and normed on over 100 countries worldwide (Mailloux, Parham, Smith Roley, Ruzzano & Schaaf, 2018, p.2). The EASI was born, which consists of 20 subtests.

The international normative data collection began in 2019 and is being completed by more than 2000 international therapists (Mailloux, Parham & Smith Roley, 2019, p.5). In the SAn context, normative data collection for the EASI has been completed. The study used a representative sample of 250 children, from four provinces, who were between the ages of 3-5 years (Van Jaarsveld, personal communication, 11 February 2020).

2.3.2. Informal Assessments, using ASI® constructs, used in the SAn context

Therapists cannot use standardised assessments in isolation as they cannot alone measure the child's functional abilities (Schaaf & Mailloux, 2005, p.64; Ayres, 2005, p.143). Informal assessments are often used alongside formal assessments to provide meaning and interpretation to the numerical data obtained from formal assessment (Schaaf & Mailloux, 2005, p.64).

Some tools are available to help therapists' structure skilled observations (Schaaf & Mailloux, 2015, p.64). The COs is an example of such a tool. It is an informal and supplemental assessment (SAISI, 2005).

The COs and the COs of Gross motor subtests are popular informal observational tools used by 98% of SAn therapists (Janse Van Rensburg *et. al.*, 2017). Although not standardised, these assessments include a manual which provides general developmental guidelines.

The COs draws from the theory of Sensory Integration and principles of neurodevelopment (SAISI, 2005). This implies that the theory used to develop the assessment comes from ASI® (Kramer, Bowyer, O'Brien, Kielhofner & Maziero-Barbosa, 2009, p.56; Hinjosa, Kramer & Luebben, 2010, p.3; Ayres, 1989).

ASI® assessments investigate the child's sensory motor developmental progression (Schaaf & Mailoux, 2015, p.61). To administer and interpret ASI® assessments, therapists must have insight into typical development (Schaaf & Mailoux, 2015, p.7).

The researcher could not find studies which identify the reliability and validity of the COs and the COs of gross motor items. This emphasises the need for further research regarding the validity and the reliability of these assessment. Another relevant concern which may affect the psychometric soundness of these assessments is a limited scoring system, that depends on the skill of the

therapist. These assessments also make use of outdated American norms, which may not be appropriate in a contemporary SAn context (SAISI, 2005). Lastly, the administration criteria in the COs is open to interpretation, which can cause variance in the administration between therapists (SAISI, 2005).

Although these assessments have their limitations, SAn paediatric therapists continue to use them as they are cost effective and purchases can occur without an ASI® qualification (SAISI, 2004; SAISI, 2005). The COs used in isolation can provide therapists, with no access to the SIPT, with some information about the child's sensory profile, where they would not otherwise have had means to do so.

Van der Linde (2019), confirmed that financial constraints in the SAn setting hinder the use of formal assessments such as the SIPT. In fulfilment with her PhD she developed the SAn Sensory Integration Screening Instrument (SASISI), which is an affordable, culturally appropriate screening assessment, that only takes an hour to administer (Van der Linde, 2019, p.243).

Researchers in South Africa need to continue to perform studies to investigate the psychometric soundness of observational assessments, and to develop culturally appropriate assessments, to decrease the risk of subjective therapist bias in assessment.

The researcher will describe the COs in detail in the upcoming section.

2.4. CLINICAL OBSERVATIONS BY SAISI

2.4.1. An introduction to Clinical Observations

COs is a non-formal and supplemental assessment developed by SAISI (2005) and comprises of 20 subtests. Its purpose is to provide observational data in evaluation (SAISI, 2005).

COs assess the child's postural stability, coordination, rate and quality of movement and the child's ability to inhibit primitive reflexes (Blanche, 2002; Wilson, Pollock, Kaplan, Law & Farris, 1992, p.776).

Potgieter (2018) investigated performance of five-year-old SAn children on 10 frequently used subtests of the COs by SAISI (2005). Potgieter (2018) recommended further research to investigate all the subtests of the COs (SAISI, 2005; SAISI, 2016).

COs (SAISI, 2005) are being revised (SAISI, 2016). They comprise of 30 subtests. Revised COs (SAISI, 2016) propose new subtests to inform the holistic observation of the child. Researchers have not yet studied performance of typically developing SAn children on newly proposed subtests. This informs the need to research the newly added subtests of the revised COs (SAISI, 2016) to establish performance of SAn children.

To better understand the COs, the researcher reviewed the historical relevance and development of the COs.

2.4.2. A brief historical overview of Clinical Observations

Ayres proposed 11 Cos subtests of children with learning disabilities (McConnel, 1994; Ayres,1972; Smith Roley, Mailloux, Miller, Kuhaneck & Glennon, 2007; Schaaf & Miller, 2005). Ayres recommended completion of COs alongside formal assessments (Blanche, 2002; Schaaf, Schoen, Smith Roley, Lane, Koomer & May-Benson, 2010, p.148).

Ayres' colleague Johnson (1977) changed the initial format of COs to consist of 19 subtests. Wilson (1984) later revised the COs and added five subtests (McConnell,1994). Neither Wilson nor Johnson's protocol made use of standardised administration and scoring.

Critics questioned the objectivity of COs because of the non-standardised administration and scoring. Researchers attempted to improve the objectivity

of COs (Dunn, 1981). Dunn (1981) developed, A guide to testing COs in kindergartners (preschool) children, normed on a population of 263 American children. The observations were however only applicable to children up to the age of five years. The SAISI COs contains most of the subtests included by Dunn, except for of the, “rising to stand” subtest.

Another assessment tool aimed at improving the objectivity of COs is Clinical Observations of Motor and Postural Skills (COMPs), based on the original format of COs by Ayres (1976) and Johnson (1977). Wilson, Pollock, Law, Kaplin and Farris (1992) identified that the COMPs is a valuable screening measure for therapists with limited time available for assessment (assessment completion is 15 minutes), applicable to a wide age group (five to 15 years) and that it is more reliable than other versions of COs. The COMPs, however, only comprises of six observations suggested by Ayres (1972).

SAISI released the first SAn publication of the COs in 1981 (SAISI 2019). SAISI then released the first COs training video based on Ayres’ work (SAISI, 2019).

Internationally test development based on the original clinical observations by Ayres continued to occur. Publication of the COMPs occurred in 1994 (Wilson, Pollock, Kaplan & Law, 1992). The assessment applied for children aged five-nine years. Blanche (2002) published the Observations Based on Sensory Integration Theory in 2002, which included similar subtests included in the SAISI COs such as Thumb finger touching, dysdiadokokinesis, Eye Movements, Schilder’s Arm Extension, Supine Flexion, Prone Extension, Equilibrium reactions, Protective Extension, Co-Contraction and Gravitational Insecurity (Blanche, 2002). Blanche has since collaborated with Reinoso and Blanche Keifer (2020) to develop the Structured Observations of Sensory Motor Integration (SOMI-M) which will potentially be in publication by November 2020, it has however been developed in the USA and current exchange rates result in the assessment being unaffordable to most SAn therapists.

SAISI published Clinical Observations of Gross Motor Items in 2003. A group of expert therapists based in Cape Town developed the assessment. They published a second edition in July 2004 (SAISI, 2004).

The most recent update of COs, by SAISI's research committee, occurred in 2005. This is the second revision by SAISI (2005). SAISI (2005) COs booklet comprises of 20 subtests, with a criterion-referenced three-point scoring system (SAISI, 2005, p.4). Diagrams in this booklet were reproduced according to the original diagrams by Dunn and subtests are similar to that of Dunn (1981 in SAISI, 2005, p.1).

SAn therapists continue to use the COs by SAISI (2005) and the COs of Gross Motor Items by SAISI (2004) supplementary to the SIPT (SAISI 2019, p.234).

2.4.3. A detailed investigation of the 11 Clinical Observations subtests that will be the subject of the study

Potgieter (2018) has already investigated 10 of the COs subtests (SAISI, 2005) also forming part of the revised COs (SAISI, 2016), on a SAn population. These subtests include Asymmetrical Tonic Neck Reflex (ATNR) and Symmetrical Tonic Neck Reflex (STNR), Dysdiadokokinesis, Thumb-finger touching, Finger-to-nose test, Supine Flexion posture, Prone Extension posture, Equilibrium reactions, Gaze Stability, Schilder's Arm Extension and Standing balance.

Potgieter (2018) recommended re-investigation of the performance of five-year-old children in the ATNR and STNR, following concerns about the reliability of her results in these subtests. She found that the participants in her study performed far below their expected age norms. The researcher will investigate performance of five-year-old children on the ATNR and the STNR subtests, but on a sample of children in the Buffalo City Metro. In addition, the researcher has selected subtests included in the revised COs to form part of this study (SAISI, 2016). The researcher will investigate a total of 11 subtests.

The 11 subtests that will be the focus of this study are ATNR, STNR, bilateral ball hitting, touch accuracy, tactile perception, proximal joint stability, eye movements, tongue and lip movements, jumping sequence and ideation challenge.

For this study, the researcher will summarise literature related to the relevant 11 subtests with a focus on literature related to the performance of five-year-old children. It is important to note that some subtests have newly been added to the revised COs (SAISI, 2016) -and for this reason, age reference ranges for five-year-old children on these subtests are not yet available (SAISI, 2016). The newly added subtests that did not form part of the COs (SAISI, 2005) are: the ideation challenge, tactile perception or stereognosis, tactile touch accuracy, movement of limbs to the contralateral side and bilateral ball hitting. This stresses the need to investigate age-specific performance for these subtests to enable valid scoring and interpretation of results.

The researcher will now review the literature to describe the purpose of each subtest, the administration, known age trends for each of the 11 subtests and where possible, the developmental implication if children do not perform according to the age norm of a given subtest:

i) Asymmetrical Tonic Neck Reflex (ATNR)

The ATNR subtest requires the elicitation of an ATNR reflex, in the child, if it is still active. The integration of this reflex is primarily tested.

The ATNR is a primitive reflex that develops at 18 weeks in utero and is strongest at 2-4 months (SAISI, 2005, p.72; Kowalski, Dwornik, Lewandowski, Pierożyński, Raistenskis, Krzych & Kiebzak, 2015). Primitive reflexes are automatic movement patterns that enable motor movements against gravity, in the developmental cycle (Gieysztor, Choińska & Paprocka-Borowicz, 2018, p. 167). The ATNR contributes to development. The ATNR can establish visually directed reaching and is thus the basis of eye-hand coordination (SAISI, 2005, p.72).

If a child does not integrate their ATNR they may present with the following manifestations: clumsy behaviour causing difficulties performing gross motor tasks, difficulties with midline-crossing and poor eye tracking (Gieysztor, Choińska & Paprocka-Borowicz, 2018, p. 168; Kowalski, Dwornik, Lewandowski, Pierożyński, Raistenskis, Krzych & Kiebzak, 2015). Late integration of an ATNR reflex can also indicate sensory integration dysfunction (SAISI, 2005, p.73).

Literature explaining integration of the ATNR is contradictory. The most common finding is that the ATNR integrates at 3-9 months (Kowalski, Dwornik, Lewandowski, Pierozyński, Raistenskis, Krzych, Kiebzak, 2015; Wittenberg, 2009, p.15). In a study investigating typical development and the presence of primitive reflexes in school going children ages 4-6 in Poland, it was found that the most frequently occurring reflex was a left ATNR which occurred in as much as 66% of children (Gieysztor, Choinska & Paprocka-Borowicz, 2018, p.168). The study population of this study only consisted of 35 children and can thus not be generalised. Potgieter (2018) did however find that most of the children her study on the typical development of SAn children, elicited a positive ATNR (88.33%; n=106). Potgieter (2018) suggested that this result be clarified to confirm results. The researcher will thus investigate the ATNR subtest in this study, to clarify to which extent, the ATNR is present in five-year-old children in SA.

The examiner administers this subtest by asking the child to assume the four-point kneeling position. The examiner then rotates the child's head 90° left and right respectively from the midline (SAISI, 2016, p.3). The ATNR subtest primarily assesses the degree of elbow flexion to the contralateral side that the child's head is rotated (SAISI, 2005, p.73). According to Dunn (1981), a degree of 25 ° elbow flexion constitutes a positive ATNR. However, the degree of flexion is not a good indicator of a present ATNR in a five-year-old child and the presence of the ATNR in reflex inhibiting position is a better sign of a positive ATNR (SAISI, 2005, p.72). Whether the ATNR should be assessed with eyes open or closed remains an inconsistency. Parmenter (1983)

suggested that the ATNR be assessed with the child's eyes open, whilst Ayres (1972) assessed the ATNR with the child's eyes closed.

ii) Symmetrical Tonic Neck Reflex (STNR)

The STNR subtest requires the elicitation of an STNR reflex, in the child, if present. Integration of this reflex is primarily tested.

The STNR is a primitive reflex that emerges 6-9 months post birth and integrates at 9-11 months. (Gieysztor, Choińska & Paprocka-Borowicz, 2018, p. 168; Grzywniak, 2016, p.120). The STNR facilitates a counteracting force against gravity through assisting the infant to move up from their hands and feet into a prone position. The STNR further elicits integration of the Tonic Labyrinth Reflex, facilitates independent movement of the upper and lower extremities and facilitates development of depth perception and eye tracking (Grzywniak, 2016, p.120)

If a child's STNR does not integrate developmental consequences may occur. These include poor posture (this typically presents with hunched shoulders and back and the child leaning forward in what is known as a 'writing with nose' phenomenon), this posture may cause fatigue in the child (Grzywniak, 2016, p.120; Gieysztor, Choińska & Paprocka-Borowicz, 2018, p. 168). The child may also present with poor coordination of hand and eye movements (Grzywniak, 2016, p.120; Gieysztor, Choińska & Paprocka-Borowicz, 2018, p.168;). The child may experience difficulties in performing tasks in occupational performance areas such as sitting at a desk, learning to swim and playing ball games (Taylor, Houghton & Chapman, 2004, p.26). Taylor, Houghton & Chapman (2004) found in their study consisting only of boys, with a mean age of 8.6 years, that correlations could be made between a present ATNR, STNR and Tonic Labyrinth Reflex (TLR) and Attention Deficit and Hyperactive Disorder (ADHD). The results show a correlation with all indices of Conner's Global Index for ADHD.

The examiner administers this subtest by asking the child to assume a four-point-kneeling posture (SAISI, 2016, p.3; SAISI, 2005, p.34). The examiner will then move the child's neck into flexion and then into extension (see Appendix 10) (SAISI, 2005, p.34). The examiner should primarily observe if the child extends their elbows, arches their back and leans back onto their haunches in neck extension and whether the child flexes their elbows in neck flexion (SAISI, 2005, p.35).

iii) Bilateral ball hitting

The bilateral ball hitting item requires the child to hit a ball in different planes from their midline, holding a cardboard roll between their hands.

It primarily assesses the child's midline-crossing and can additionally assess bilateral integration and sequencing (SAISI, 2016, p.24; Schaaf, Schoen, Smith Roley, Lane, Koomer, & May-Benson, 2010, p.117).

The researcher could find a large body of literature describing developmental trends and developmental consequences of midline-crossing, definitions describing midline-crossing were however vague and limited.

Ayres (1984) describe midline-crossing as the ability to use one hand in the contralateral side of space, to perform a purposeful activity. Ayres hypothesised that midline-crossing is an important skill required to develop hand dominance. Ayres (1972) noted that midline-crossing difficulties did not relate to the physical inability to cross the midline, but rather reluctance of the child to cross the midline with their hands, eyes or legs. The ability to perform midline-crossing is an important skill in handwriting development and is important for forming geometric shapes such as a cross (Beery & Buktenica, 1989).

In the developmental sequence, midline-crossing emerges during the development of contralateral reaching and is an important component in the development of bilateral coordination and vice versa (Stilwell, 1987, p.783;

Ayres & Cermak, 1984, p.35). Midline-crossing is a developmental trend that occurs between the ages of two to nine years (Stilwell, 1987, p.789). According to Stilwell (1987), children will more frequently perform manual midline-crossing between the ages of four and nine years old. Michell and Wood (1999) state that failure to cross the midline by ages four-five can cause a delay in the child's sensory motor development. Literature describing norms for manual midline crossing are inconsistent, limited and dated, which puts into question the relevance of this literature in the current day.

This subtest also assesses bilateral integration and sequencing. Bilateral coordination is the ability of a child to use two parts of their body simultaneously to produce a motor task (Schaaf, Schoen, Smith Roley, Lane, Koomer & May-Benson, 2010, p.117). It serves the foundation for skilled tasks such as manipulating fasteners on clothing and eventually assists in development of unilateral tasks such as writing (Schaaf, Schoen, Smith Roley, Lane, Koomer & May-Benson, 2010, p.117). Sequencing refers to the child's ability to perceive and execute a series of ordered events in time in an integrated fashion (Schneck, 2010, p.380).

At ages four to six, bilateral hand coordination and eye-hand coordination improves gradually. At five years of age, the child should be able to maintain the stability of the trunk and the upper limbs. Specifically, in bilateral tasks such as throwing a ball, a five-year-old child should be able to align their shoulders, elbows, and wrists when throwing a ball (Exner, 2010, pp.348). Children who experience bilateral and sequencing dysfunction often simultaneously experience vestibular-proprioceptive problems (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.142; Schaaf & Mailloux, 2015, p.22).

The vestibular component in bilateral sequencing dysfunction may also account for the child having difficulties with postural-ocular control (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.142). Functionally children with bilateral integration difficulties struggle with coordinating two parts of their body to complete a bimanual task resulting in

difficulty in tasks such as holding a piece of paper while writing simultaneously (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.142).

Equipment required for this subtest` is a 30 cm cardboard roll (the inside of a foil roll) and a scrunched-up newspaper ball suspended from a stocking. The subtest's administration requires the examiner to give the child a cardboard roll with the long edge facing forward and the cardboard roll between both hands of the child, whilst the child maintains a cross-legged seated position. The examiner then swings a suspended ball to the child in different planes from the midline and expects the child to hit the ball back with the cardboard roll (see Appendix 10) (SAISI, 2016, p.23-24).

iv) Tactile Touch Accuracy

The subtest, tactile touch identification requires the child to identify different parts of their body without visual stimuli (with their eyes closed) (SAISI, 2016, p.27). It primarily assesses somatosensory discrimination.

Discrimination of tactile-proprioceptive input involves the ability to identify and interpret the qualities of a sensory experience (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.121). Children with poor sensory discrimination struggle to interpret qualities of sensory input. This results in difficulties identifying the similarities and differences of incoming sensory input (Miller, Anzalone, Lane, Cermak & Osten, 2014, p.138). Poor sensory discrimination in the child may also result in a poor body scheme, because the accurate interpretation of sensory stimuli is the foundation for the feed-forward systems and for planning movement and postural responses. Accurate touch perception is also vital for guiding adjustments that need to be made for refined movements (Bodison & Mailloux, 2006, p. CE-7).

In this item, the therapist should observe impulsivity and possible tactile defensive or aversive behaviour which may inform the child's sensory profile (SAISI, 2016, p.27). Children who experience tactile sensitivity often respond to tactile input with sympathetic nerve activation causing a fight, flight or freeze

responses (Miller, Anzalone, Lane, Cermak & Osten, 2007, p.138). Emotional responses can also occur such as irritability, moodiness and poor socialisation (Miller, Anzalone, Lane, Cermak & Osten, 2007, p.138).

The Finger Identification subtest is a similar subtest to touch accuracy in the SIPT (Bodison & Mailloux, 2006, p. CE-7). The Tactile Perception: Localisation subtest is also a similar test which was developed for the EASI (Mailloux, Parham & Smith Roley, 2019, pp.77). This item uniquely specifies the degree of pressure the examiner must place on the child's arm and hand, when providing a tactile input and specifies that a child may point to a location 1cm from the location where the examiner pointed (Mailloux, Parham & Smith Roley, 2019, pp.78).

The child is seated with their legs crossed for this subtest. The examiner administers this subtest by requesting the child to localize four different points on their dominant forearm, hand and fingers that the therapist touches, while their eyes are closed (SAISI, 2016, p.27).

v) Tactile Perception / stereognosis

The subtest requires the child to identify objects without visual cues, base of haptic perception done. The subtest primarily assesses somatosensory discrimination of the child.

Stereognosis can be defined as identification of the form of an object by palpitation, without visual input (Rich, Cassidy, Menk, Van Heest, Krach, Carey & Gillick, 2017; Meenakshi, Gujjari, Thippeswamy & Raghunath, 2013). Stereognosis involves input from the tactile sensory system and motor system of the body. The tactile sensory system specifically receives information regarding the perceptual features of objects, while the motor system allows for the interaction and manipulation of objects (Kalagher & Jones, 2011). Typical somatosensory function allows the child to be aware of their body parts in the relation to objects and the environment (Dunn, 1981).

The researcher could find a similar subtest in the EASI and the MAP (Mailloux, Parham & Smith Roley, 2019; Miller, 1988).

The subtest in the MAP is called Stereognosis, it consists only of a 3D portion in which the child is expected to identify four objects, with the occlusion of visual input (Miller, 1988). The MAP uses one distractor object, to add conflicting a conflicting tactile stimulus.

Similar to this subtest, the EASI also requires the child to identify 3D and 2D objects with tactile stimuli only (Mailloux, Parham & Smith Roley, 2019, p.87). The manual Form Perception subtest is a similar subtest in the SIPT. The subtest measures stereognosis through the child's ability to match a block held in hand with a visual counterpart (Schaaf & Mailloux, 2015, p.66).

The equipment required for this subtest is a sensory/ feely box filled with five age-appropriate items for five-year-old children. This subtest is administered by asking the child to identify age related familiar objects in a sensory box/ 'feely box' without visual cues (They may not look in the box or remove items from the box) (see Appendix 10) (SAISI, 2016, p.29).

vi) Proximal Joint Stability

The subtest, proximal joint stability requires the child to maintain two postures when resistance is applied at the proximal joints in different planes. It primarily assesses proprioceptive discrimination. Secondly the assessment can test vestibular and bilateral function.

Observations indicative of poor proprioceptive discrimination are an inappropriate use of weight bearing in a four-point kneeling posture, compensating by becoming rigid when asked to assume the four-point kneeling posture (SAISI, 2016, p.16; Roseann, Schaaf & Mailloux, 2015, p.19).

A child that presents with poor equilibrium reactions and postural responses in this subtest may also present with vestibular and bilateral deficits (Schaaf &

Mailloux, 2015, p.20). Children who fall out in this area may struggle with staying upright for long periods of time, slouching and avoidance of maintaining a seated position. Additionally, children may have difficulty with tasks that involve coordination of both sides of the body such as swimming (Schaaf & Mailloux, 2015, p.22).

This subtest has been newly added to the revised COs and as a result, age norms have not yet been established (SAISI, 2005).

The examiner requires the child to assume a four-point kneeling position (SAISI, 2016, p.14). The examiner then adds light pressure at different proximal joints of the child's body (hips and shoulders) and in different planes; this is done in both the four-point kneeling (SAISI, 2016, p.16).

vii) Slow movements

The slow movements subtest requires the child to move their limbs in a slow symmetrical pattern, at a slower pace than usual (SAISI, 2005, p.66). It primarily assesses vestibular processing and movement control as arms dropping down in this subtest may be indicative of poor co-contraction (SAISI, 2005, p.60; Roseann, Schaaf & Mailloux, 2015, p.22). Poor shoulder stability of a specific limb can also be identified in this subtest; observed through identifying which hand returns to the starting position first (this is normally the weaker limb) (SAISI, 2005, p.60). Asymmetry of upper limbs can also be indicative of bilateral integration problems (SAISI, 2016, p.20; SAISI, 2005, p.60). Additional observations that can be made in this subtest is the child's bilateral integration ability and motor planning ability. Children with motor planning difficulties may struggle with learning new skills, poor performance in sports or movement activities and limited play skills (Schaaf & Mailloux, 2015, p.21).

At five years of age a child should be able to execute the movement in a smooth and symmetrical fashion. It is typical to observe some differences in their left and right upper limbs (SAISI 2016, p.20, p.60)

The researcher administers the subtest in a seated position. The child is expected to mirror a slow symmetrical movement demonstrated by the examiner, following the examiners demonstration, and a second time when the child executes the movement with the examiner (see Appendix 10). The time taken to complete the movement is not timed as the quality of movement is more important (SAISI, 2016, p.20).

viii) Eye tracking

Eye movements refer to the ability of both eyes to move within their orbit, to adjust focus on an object (Serenio & Bolding, 2017).

This subtest primarily assesses the child's ability to change and align gaze in accordance to a moving object and in accordance to a stable object. In order to align gaze our eyes need to move in synchronisation in order to ensure an image is focused on the fovea of both eyes (Serenio & Bolding, 2017; Orban de Xivry & Lefèvre, 2007, p.11). This is so that an accurate image is relayed to our visual cortex (Serenio, Babkin, Hood & Jeter, 2010) Our eyes are able to do so by means of smooth visual pursuits, vergence and saccadic eye movements (Purves *et. al.*, 2001). Visual pursuits allow the eyes to focus on a moving object, whereas saccadic movements allow the eyes to focus on a stable object (Purves *et. al.*, 2001). Verging eye movements are those which allow us to focus on an object at different distance (Irwin, 2001).

The subtest, eye tracking requires the child to track an object in conjugate planes (horizontally and vertically), perform midline crossing, perform vergence (specifically convergence) and lastly quick localisation. The examiner determines whether the child is able to complete eye tracking in line with their developmental age. The subtest additionally observes the child's vestibular ocular discrimination (SAISI, 2016, p.17). In early childhood development age appropriate visual pursuits, are essential for the developmental of eye-hand coordination. Eye hand coordination is necessary

for performance in functional tasks such as reading and writing (Schneck, 2010).

Therapists do not specialise in visual tracking. The subtest is however valuable for screening purposes and a resource that can be used to assist the diagnosis of neurodevelopmental disorders. It allows the therapist to identify plausible visual ocular dysfunction, to streamline referrals to optometrists. This form of screening is easy to administer, but not without flaw. Blignaut, Janse Van Rensburg & Oberholzer (2018) state that manual visual tracking is subjective and vulnerable to human error.

Eye tracking follows a typical developmental sequence. The endeavour to track targets develops quickly in the first three months after birth (American Optometric Association, 2020). At 6-8 months the infant can perform eye tracking predominantly with eye movements and some head movements (Von Hofsten & Rosander, 1996; Blanche, 2002).

The vertical plane is the most primal plane and thus a child should be able to complete smooth eye tracking, in this plane, at five years of age (SAISI, 2005, p.58).

A midline jump in the horizontal plane still falls within the norm for five-year-old children, which means it is not indicative of dysfunction (SAISI, 2005, p.58). A midline jump in the vertical plane is however indicative of dysfunction (De Gangi, Berk & Larson, 1980).

Only at seven years can we expect a child to perform convergence smoothly (American Academy of Ophthalmology, 2017).

Compensations indicative of poor vestibular ocular discrimination include making use of head movements instead of eye movements in eye tracking, uncoordinated movements and loss of balance during head movements, wandering of eyes from the target and excessive blinking which may result in watering of the child's eyes, squinting, distractibility and the elicitation of

nystagmus (may be normal in the extreme periphery) (SAISI, 2016, p.17; Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.137,138,139).

The Ocular Motor & Praxis subtest is a similar subtest in the EASI (Mailloux, Parham & Smith Roley, 2019, p.43). Unlike this subtest the EASI includes a divergence subtest. The ocular location or quick location subtest also has some differences to this subtest (Mailloux, Parham & Smith Roley, 2019, p.43). The most markable difference is that the child is required to identify an object in multiple locations, quickly. This subtest only requires the child to identify an object in one location, quickly (Mailloux, Parham & Smith Roley, 2019, p.43).

Administration of this subtest has two sections, with separate components, which are described in detail in addendum 6.

ix) Tongue and lip movements

This test requires the child to move their tongue in different planes and perform different oral movements with their mouth. The subtest primarily assesses oral motor coordination and sequencing. The child's performance in this subtest also depends on their tactile and proprioceptive perception in the mouth area (Bodison & Mailloux, 2006 p. CE-6). This is because the child cannot see their own movements.

A child with poor oral motor coordination and sequencing may present with difficulty closing their mouth and dribbling, indicative of low tone (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.144). The examiner should make additional observations, such as the inability to sustain tongue protrusion and associated movements that are characteristic(s) indicative of dyspraxia (SAISI, 2016, p.30; SAISI, 2005, p.64).

Oral-motor coordination is an important skill for appropriate social interaction (Bodison & Mailloux, 2006, p. CE-6). A five-year-old child requires oral motor coordination and sequencing to articulate their words in order to tell stories and

use his/her tongue to form words (Exner, 2010, p.332; Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.144). It should be possible for all five-year-old children to complete the side-to-side oral movements and possible for 95% of children aged five years to perform circular oral movements (SAISI, 2005, p.64).

Oral Praxis is a similar subtest the SIPT (Bodison & Mailloux, p. CE-6). The researcher could identify a similar subtest in the EASI called Praxis: Sequences (Mailloux, Parham & Smith Roley, 2019, p.49). The subtest from the EASI is further classified as the Face Trial items (Mailloux, Parham & Smith Roley, 2019, p.49).

To administer this item, the examiner and the child should be positioned directly across from one another. The examiner administers the item by showing the child different tongue movements (circular, up and down movements) and different mouth movements (kissing face and blowing up cheeks). The examiner then gives the child the opportunity to execute each of the tongue movements, one at a time (see Appendix 6) (SAISI, 2016, p.30).

x) Jumping sequence

The subtest jumping sequence assesses the child's ability to accurately imitate three jumping sequences. It primarily assesses bilateral integration and sequencing as two parts of the body need to be used in unison in a skilful and smooth pattern (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.142).

Children that struggle with bilateral coordination and sequencing often have good ideation (ability to conceptualise an idea) and motor planning skills, such as running, but struggle with execution of anticipatory actions, refining timing and spatial coordination (Schaaf, Schoen, Smith Roley, Lane, Koomer & May-Benson, 2010, p.142). Projected action sequence problems are also commonly observed in children with bilateral coordination and sequencing difficulty and involves difficulty in the integration of vision and movement which

hinders putting motor acts together to accomplish a goal in future time and space (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.142).

In the COs of gross motor items, jumping with two feet together is assessed in subtest 11: jumping sequence. Children aged four years zero months to five years eleven months should be able to complete a series of jumps over a distance with two feet together (SAISI, 2004, p.38). This requires bilateral motor coordination and sequencing. Bilateral motor coordination requires the musculoskeletal system and the nervous system to work in harmony to deliver an output of a rapid, accurate and balanced motor response (Corbin, Pangrazi & Franks, 2000; Lopes, Stodden, Bianchi, Maia & Rodrigues 2012).

The examiner administers this subtest by demonstrating jumping sequences to the child. The child is expected to perform three jumping sequences. These sequences are:

- Jumping consecutively with two feet together, whilst lifting both feet off the floor (SAISI, 2004, p.38).
- Jumping with two feet together and alternating by jumping on one foot to perform a series of jump-hop movements
- Jumping with legs open and closed/ abduction and adduction. The examiner then gives the child a chance to execute the movement in a coordinated fashion.

According to SAISI (2005, p.84), a child at the age of three and a half years should be able to jump with both feet off the ground. This implies that a five-year-old child should be able to jump with their feet together. A gap in literature could be found as age norms are not available for a jump-hop sequence or jumping with legs open and closed (SAISI, 2019, p.265; SASI, 2004, p.39).

xi) Ideation challenge

The subtest Ideation challenge requires the child to conceptualise, plan and perform a play task using an object not normally used for play (SAISI, 2016). The subtest primarily assesses the child's ideational praxis. Ayres (1985, 2011) defined praxis as the foundation which enables the child to manage their physical environment to perform meaningful and functional tasks. We can further define ideational Praxis as conceptualising an action or simply knowing what to do with an object (Bundy, Lane & Murray, 2002, p.478). Ideating an idea occurs before the child has developed a motor plan (Parham & Mailloux, 2015).

May-Benson and Cermak (2005) identified that ideational praxis difficulties are entirely separate from other praxis dysfunctions identified by Ayres (May-Benson, 2005). Based on her results, May-Benson developed the Test of Ideational Praxis (TIP), an assessment that focuses particularly on identifying ideation difficulties in the child.

A child with the appropriate ideational function can generate multiple ideas in play when an examiner presents them with a novel item (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.140). In contrast, children with ideational praxis difficulties struggle to interact with new objects in their environment as they cannot conceptualise what to do with new objects or how to manipulate these objects (May-Benson & Cermak, 2007).

Children who struggle with ideational difficulties may present with signs such as: fewer ideas than other children in play seen as scripted play themes, use of less language to describe activities, poor emotional regulation which manifests in behaviour such as breaking toys and a tendency to play rigid manner (Lane, Ivey & May-Benson, 2014; Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.141). Children may also not recognise the properties of an object e.g. trying to stand on a ball instead of throwing it (Schaaf, Schoen, Smith Roley, Lane, Koomer & May- Benson, 2010, p.140).

SAISI (2005) has not included this subtest in the current COs as formal norms have not been established (SAISI, 2016, p.30). Developmental indicators could, however, be found in the TIP (May-Benson, 2005), which is the first assessment that objectively measures ideational praxis. According to May-Benson (2005), children at five years can conceptualise or ideate 16.2 tasks within a five-minute period, whereas children with ideational difficulties at this age can only ideate 8.6 tasks (May-Benson, 2005, p.7). These developmental trends are a valuable reference. They can, however, not be generalised because of a small convenience sample of only 84 participants (Cermak & May-Benson, 2007, p.151).

The ideation subtest in the EASI is similar to this subtest (Mailloux, Parham & Smith Roley, 2019, p.20). The EASI provides the child with two demos, which allows the child to understand the concept of what the examiner is expecting them to do (Mailloux, Parham & Smith Roley, 2019, p.20). The EASI also makes use of a chair, rather than a cloth as the focal novel object (Mailloux, Parham & Smith Roley, 2019, p.21).

Equipment required for this subtest is a 30cm by 20cm cloth. The examiner administers this subtest by showing the child the cloth and then handing the child the cloth. The examiner then asks the child to show them how they can play with the cloth (SAISI, 2016, p.30).

2.4.4. The Method of selecting should and should not have parameters for the measurement instrument

The researcher reviewed assessments which had similar subtests to those included in this study. The researcher reviewed the following assessments:

- The Clinical Observations of Motor and Postural Skills (COMPS)
- The COs (2005)
- The COs of Gross Motor Items (2004)
- The SIPT
- The EASI
- The MAP (1988)

- The DeGangi-Berk of Sensory Integration (1983)
- The TIP (2005)

This helped establish should and should not have parameters, but also assisted the researcher with establishing administration procedures for items newly added in the revised COs.

A large body of literature was available on the STNR and the ATNR, which are widely researched subtests, both in the field of occupational therapy and physiotherapy. The researcher consulted and reviewed literature and included observations supported by literature for the should and should not have observation criteria (Gieysztor, Choinska & Paprocka-Borowicz, 2018, p.168; Potgieter, 2018; Gieysztor, Choińska & Paprocka-Borowicz, 2018, p. 168; Grzywniak, 2016, p.120; Kowalski, Dwornik, Lewandowski, Pierozynski, Raistenskis, Krzych, Kiebzak, 2015; Wittenberg, 2009, p.15).

Lastly, the researcher regularly consulted with expert, ASI® qualified paediatric therapists to review the measurement instrument, and the SH and SNH parameters. Collectively, each SH and SNH parameter was clearly delineated. See Appendix 1 for a description of each SH and SNH parameter used in the measurement instrument.

2.5.CONCLUSION

Section one of the literature review briefly discussed the history, controversy (Leong, Carter & Stephenson, 2014, pp.183-206; Hyatt, Stephenson & Carter, 2009, p.319; Carter & Stephenson, 2014, p.201) and value of ASI® (Schaaf & Nightlinger, 2007, p.240; Schaaf & Mailloux, 2015, p.9; Smith Roley, Mailloux, Miller Kuhaneck & Glennon, 2007, p.CE-2). The context of ASI® in the SAn setting is then briefly deliberated. Evaluation in the paediatric setting is described in section two. This section describes the typical development of the five-year-old child, as well as developmental differences between boys and girls. Section three highlights that the COs is a useful tool to use in combination with the SIPT and that the assessment is used in high frequency in SA. The

section also highlights that many therapists in resource constrained areas are unable to afford the exorbitant costs of the SIPT toolkit, additional booklets needed for test administration and scoring discs. The researcher posits that this results in many SAn therapists using the COs in isolation, to provide some information about the sensory profile of the child.

Lastly, section three recognises that the EASI could potentially decrease the cost of ASI® assessment in SA. It is, however, unclear when the EASI will be ready for use in SA and what the cost of administering the EASI will be. The researcher hypothesises that SAn therapists will continue to use the COs because, at present, it is one of the most affordable and accessible ASI® assessments in SA.

The history of COs was finally described in section four. The researcher discussed the revision of COs in the SAn context. Literature identified that the revision of COs is underway, however, there are no concrete and clearly described instructions for administering the newly added subtests (SAISI, 2016). These subtests cannot be implemented into practice without being piloted and describing clear structured observations. This section also exposed the norms used for the COs by SAISI (2005) are from an outdated American sample.

The researcher lastly delved into describing each of the 11 subtests included in this study, their administration procedures and available literature which support the relevance of each subtest.

The literature study identified that limited research is available describing age related developmental trends of five-year-old children in SA. All the points discussed identify the need for further research on the COs and motivates the need for the implementation of the study.

The research methodology used to implement the study is described in Chapter 3.

CHAPTER 3

RESEARCH APPROACH AND METHODOLOGY

“Research is the dynamic process of collecting, analysing and interpreting data in order to understand a phenomenon and it is regarded to be the lifeblood of a professions development” (Brink, Van der Walt & Van Rensburg, 2012, p.52)

In chapter two literature provided the rationale for the implementation of the study. The researcher deliberated over available Ayres Sensory Integration® (ASI®) assessments and delved into factors impacting the reliability and validity of these assessments. The importance of the use of informal assessments in the South African (SAn) setting was discussed together with reasons why SAn therapists continue to use these assessments, despite the lack of evidence pertaining to their reliability and validity. The pertinent topic discussed was the use of the Clinical Observations (COs) by SAISI (2005). The researcher highlighted that limited research is available which determines whether the outdated American norms used for scoring subtests of the COs remains relevant to the SAn population today.

This chapter will describe the research approach and methodology used in this study.

3.1. RESEARCH APPROACH AND STUDY DESIGN

3.1.1. Research Approach

The researcher implemented a quantitative study. The study design included an observational, descriptive component and an analytical, cross-sectional component.

3.1.2. Explanation of study design

The researcher followed the principles of a quantitative study. A quantitative study characteristically quantifies trends between given variables and makes use of deductive reasoning to draw conclusions from identified trends (Fouché & Delpont, 2011, pp.63-64).

The researcher implemented an observational, descriptive research approach. An observational study is one in which no experimental manipulation of study variables occurs (Fouché, Delpont & De Vos, 2011, p.156; Brink, Van der Walt & Van Rensburg, 2012, p.112). The researcher observed and described the performance of five-year-old children in 11 subtests of the Revised Clinical Observations (RCOs) by SAISI. This study design is appropriate as the researcher simply reported her structured observations without the intent to provide a cause and effect (causational) relationship (Brink, Van der Walt & Van Rensburg, 2012, p.112).

To maintain the natural state of participants, the researcher did not provide occupational therapy intervention at any point.

The study design also included an analytical, cross-sectional component. A cross sectional study design examines the relationship between two variables to identify correlations and helps the researcher determine to what extent similarities and differences exist between two study variables (Fouché & De Vos, 2011, p.96-97). In this study, a comparison was drawn between the performance of boys and girls, with the purpose of predicting character traits that may differ between boys and girls in the performance of the RCOs (Fouché & De Vos, p.97).

A cross sectional study does not re-occur (Brink, Van der Walt & Van Rensburg, 2012, p.101). This means that this study specifically describes the performance of five-year old children in the RCOs, attending Grade R in 2019 only; implying that the performance of grade R children in the RCOs is not measured in previous and/ or subsequent years. This was the most feasible study design, as even with the contribution of a study grant from the South African Institute of Sensory Integration (SAISI), funding was limited. This study design was also the most practical to implement for the fulfilment of a master's degree as it did not take an extended period of time to complete.

3.2. POPULATION

A study population refers to all possible persons who meet the criteria for participation in the study, within a universe (Burns & Grove, 2009, p.343). This affords them potential inclusion in a study (Strydom, 2011, p.223).

The target population for this study consisted of typically developing five-year-old SAn children, attending Gr R, at public schools in the Buffalo City Metro situated in the Eastern Cape (EC). The Buffalo City Metro represents the area between East London, Bhisho and King Williams Town. The study population included both boys and girls. Children from the Buffalo city Metro were selected to participate in the study as the researcher resided in East London during the duration of the study.

The study intended to include a population which was inclusive of children from both upper and lower socioeconomic circumstances. To achieve this, the study took place at public or Department of Education (DoE) registered schools.

In the Buffalo City Metro, the top three spoken languages are isiXhosa, English, and Afrikaans (Statistics South Africa, 2011). The study was designed to cater for the inclusion of isiXhosa, English and Afrikaans-speaking children. This was to ensure that data was collected in line with the language distribution of the Buffalo City Metro and to prevent language breaks and miscommunication in the study, which could cause bias.

The age of the study population was selected for the following reasons:

- a) The researcher selected the sample age of five years-six months to five years-11 months as this is typically the age of SAn children before they enter formal schooling. Describing the developmental trends of children on these subtests could help therapists assess developmental progress of the five-year-old child's sensory-motor abilities, before they enter formal schooling.
- b) A similar study was completed by Potgieter (2017), investigating eight subtests of the COs, not investigated in this study. The age of the study

population was set to be in line with Potgieter's study. Both studies complement one another to provide updated observational characteristics of five-year-old children with the sum total of 19 subtests in the RCOs. The studies also have the potential to assist SAISI in the test development of the RCOs.

- c) The DoE published the National Strategy on Screening, Identification, Assessment and Support (SIAS) in 2008 (Republic of South Africa, 2014). The strategy highlights the need for screening of SAn children, by early childhood developmental practitioners, before entering formal schooling. The children in this study were all at the pre-admission age of entering grade 1. The study was, thus, aligned with the goal of providing quality assessment and screening for accurate identification of at-risk learners.

Typically developing children were selected to participate in the study, as identifying normal developmental trends can assist in early identification of significant deviations from typical developmental.

3.2.1. The criteria for the participation of children in this study were as follows:

3.2.1.1. Children were included in the study if they were:

- Between five-years-six months and five-years-eleven months of age
- Attending Gr: R at a DoE registered school in Buffalo City Metro
- English, Afrikaans or isiXhosa speaking

3.2.1.2. Children were excluded from the study if they:

- Had a formal medical diagnosis and thereby their behaviour would be different to that of the typically developing child e.g., neurodevelopmental and psychiatric diagnoses such as autism spectrum disorder, epilepsy or ADHD
- Used medication which may have altered their behaviour e.g., Ritalin® to treat ADHD
- Were, or had previously, received therapy from an occupational therapist, physiotherapist, speech therapist etc. as a result of a developmental delay which entails the child is not developing typically

3.2.2. The Criteria for the participation of schools in this study were as follows:

3.2.2.1. Schools were included in this study if they:

- Were DoE registered
- Offered Grade R to learners
- If they had a minimum of 15 learners enrolled in Grade R to make travelling to the school(s) viable in terms of potential participant numbers

3.2.2.2. Schools were excluded from this study if they:

- Served children who were not typically developing e.g. special needs or remedial schools

3.3. SAMPLING

3.3.1. Definition of Sampling

The research sample consists of persons selected from the population who can be considered for participation in the study (Unrau, Gabor & Grinnell, 2007, p.279). Effective sampling allows the researcher to obtain information that is representative of the population (Brink, Van der Walt & Van Rensburg, 2012, p.132). Probability or random sampling was selected for this study to prevent sampling bias and to ensure the accurate reflection of economic disparities, within the population (Brink, Van der Walt & Van Rensburg, 2012, p.134).

3.3.2. Sampling Method

The specific sampling method used in the study was stratified random sampling. This form of sampling is typically used in a heterogenous population (Strydom, 2011, p.230). It divides a given population into strata according to a homogenous characteristic (Strydom, 2011, p.230). In this study participants were divided into two strata, namely participants of higher and lower socio-economic sector (SES). Participants were randomly picked from each stratum. This method of sampling was selected to prevent bias by ensuring that the sample accurately represented the socio-economic distribution of the entire

population. Representation refers to the ability of a sample to be as analogous to the population as feasibly possible (Brink, Van der Walt & Van Rensburg, 2012, p.133).

3.3.3. Implementation of Sampling Method

Two hundred and sixty-five government schools were situated in the Buffalo City Metro, at the time of the study. Only those schools with a minimum of 15 learners enrolled in Grade R were considered for inclusion. This made travelling to schools feasible as the researcher was ensured of a large enough sample at each school. Two hundred and twenty four of the 265 schools had 15 or more learners. The total population of 224 schools was further reduced 191 schools, due to the exclusion of special needs schools.

The initial intended study sample included 100 participants. The sample size was chosen so that a generalisation could be drawn to typical performance of childling residing in the Buffalo City Metro. This population size was selected based on feasibility and ensuring that the cost of the study remained within the researcher's budget. De Vos (2005) suggests that a study sample does not always need high participant numbers to be effective. He adds that involvement of extra participants can involve exorbitant costs and thereby question the ethics of a study as the monies spent could have been better spent elsewhere. The sample was, however, large enough to make a clinically significant impact (Brink, Van der Walt & Van Rensburg, 2012, p.143).

There are marginally more females than males in the Buffalo City Metro (Eastern Cape Socio Economic Consultative Council, 2017, p.15). This indicated a similar distribution of boys and girls in this age bracket, with only marginally more girls than boys (Eastern Cape Socio Economic Consultative Council, 2017, p.15). A relatively even distribution of boys and girls was, thus, sought out for the study sample.

The department of Biostatistics at the University of the Free State (UFS), randomly selected three quintile 1-3 schools (schools of a lower SES) and two

quintile 4-5 schools (schools of a higher SES) to participate in the study. This process was impartial, with no involvement of the researcher. These schools will be referred to as schools (A to E).

The researcher obtained permission from schools A to D to participate in the study. School E did not give permission to participate in this study. Once the schools gave permission for the study to commence, parent consent forms were sent to all the Grade R classes at each school. See section 3.6.1. for details pertaining to the process followed, to obtain consent and assent from participants.

The sample of children from schools A-D participating in the study are indicated in Table 3.1.

Table 3. 1 Sample of children which participated in the study, from schools A-D

School	Quintiles	Total Learners	Boys	Girls	Total Participants
School A	4-5	29	0	4	4
School B	1-3	17	5	5	10
School C	4-5	105	7	3	10
School D	1-3	118	14	23	37
Total:			26	35	61

Several factors caused for the poor response and inclusion of children from schools A-D. This included a poor response rate of parent consent forms, drop-out of one participant and a large sample of children with medical diagnoses, such as ADHD, conduct disorder and epilepsy. Lastly, many schools had children attending grade R that did not meet the age requirements e.g., they were either too old or too young.

Table 3.1 depicts that a sufficient sample of learners from a higher SES were available from schools A-D to participate in the study. This implies that the minimum number of 14 learners from a higher SES had been included in the study. The researcher did, however, have outstanding participants from schools of a lower SES.

An additional five quintile 1-3 schools thus needed to be selected to participate in the study to reach the target sample size. The process of obtaining consent and assent from schools, parents and children was then repeated. The population distribution and participants meeting the inclusion criteria are indicated in Table 3.2.

Table 3. 2 Sample of children who participated in the study from schools F-J

School	Quintile	Total Learners	Boys	Girls	Total Participants
School F	1-3	29	3	0	3
School G	1-3	60	7	4	11
School H	1-3	64	2	4	6
School I	1-3	159	2	4	6
School J	1-3	137	10	7	17
Total:			24	19	43

At the point of completion of data collection, the total sample size consisted of 104 children, of which 50 were boys and 54 were girls. The sample size thus consisted of marginally more girls than boys. The even distribution of boys and girls was in line with the population statistics.

3.3.4. Location of Sample

All schools meeting the inclusion criteria, in the Buffalo City Metro were included in the study. This was regardless of their travelling distance from the researcher's residence based in East London or the remote location of the school, thereby preventing bias.

Majority of schools in the selected research sample were situated in King Williams Town, East London and the surrounding areas of Komga. The researcher on average travelled between 10-80km to reach each school.

3.4. PILOT STUDY

3.4.1. Definition of a Pilot Study

Prior to the commencement of the study, a pilot study was conducted. A pilot study can be defined as a diminutive version of the actual study (Brink, Van der Walt & Van Rensburg, 2012, p.174). In the context of this study, the pilot

study helped the researcher determine the accuracy in which measurement procedures were administered and the validity as well as the reliability of the measurement instrument. The pilot study also provided an initial opportunity for the researcher to trial the measurement instrument so that it could be further refined (Brink, Van der Walt & Van Rensburg, 2012, p.174).

3.4.2. The Practical Implementation of the Pilot Study

The researcher approached three private schools to take part in the pilot study. All three schools consented to take part. Two schools were based in Bloemfontein and one in East London. Arrangements were made via email and telephonic communication to determine whether the schools were willing to participate in the pilot study. The locations of the pilot studies were selected based on convenience as the researcher was residing in or close to these area(s) during the time of execution.

The sample used for a pilot study consists of individuals who meet the inclusion criteria, but do not usually form part of the study sample (Brink, Van der Walt & Van Rensburg, 2012, p.174). Both children and schools who took part in this pilot study met the inclusion criteria, excepting children did not attend public schools. This was because permission had not yet been obtained from the DoE, thus prohibiting ethical implementation of study procedures at public schools.

A total of eight children took part in pilot study 1 and pilot study 2. The gender distribution consisted of two boys and six girls. Consent was obtained from parents of children participating in the study. Children also assented to participating.

Pilot Study 1 took place in November 2018, in Bloemfontein (see appendix 2 for the measurement instrument used in pilot study 1). Pilot Study 2 took place in February 2019, in East London. A more refined version of the measurement instrument was used for Pilot Study 2 (see Appendix 3).

Several errors were identified in the pilot study. Table 3.3 indicated the errors and practical implementations which took place to eliminate research error.

Table 3. 3 Research errors in the pilot study and steps taken to avoid and correct similar errors in the main study

Pilot Studies 1 and 2	Explanation of Error	Correction of Error
<i>Researcher's level of training</i>	The researcher had not yet begun her sensory integration training.	The researcher began her Sensory Integration Training prior to the commencement of data collection in order to improve her theoretical base and clinical reasoning.
<i>Unconcise and inconsistent test administration procedures</i>	The pilot studies were reviewed by expert therapists specialising in ASI®. Upon review, it was identified that administration of test procedures was inconsistent. It was also identified that test administration procedures for the newly added subtests of the revised COs were not clearly defined.	The researcher worked closely with a co-developer of the RCOs to ensure that newly added subtests had specific and clear administration procedures that could be consistently administered, on each child participating in the study.
<i>Parent information forms did not ask for the child's date of birth</i>	The parent information forms lacked a field asking for the child's date of birth, the researcher thus wasted time obtaining the dates of births of participants from class lists.	This was easily amended by including a field to ask for the child's date of birth under the sociodemographic details of the parent information forms.
<i>Videos that did not clearly display the performance of the child in the COs.</i>	The angles in which the videos were filmed did not allow for clear scoring.	The researcher amended this by adjusting the camera to a wide-angle lens and ensuring specific angles could be identified for each subtest to prevent difficulty identifying observations for each subtest.
<i>The researcher was solely responsible for video recording of sessions in Pilot study 1</i>	The researcher identified that performing the video recording independently, proved to be challenging and	The researcher trained the interpreters prior to pilot study 2 on how to use the video camera. This was

	time consuming. The researcher also had difficulty altering focus between video recording and test administration procedures.	done to ensure smooth and quick transitions between subtests and accurate recording of each subtest.
<i>Not all plausible observations were included, for scoring, under the Should Have (SH) and Should not have (SNH) columns of the measurement instrument.</i>	The researcher identified in the pilot study that more observations could be included in the pilot study. See Appendix 1 for phase one of the measurement instrument.	The researcher liaised with expert paediatric therapists via skype video call. All subtests were individually reviewed to prevent exclusion of possible observations. See Appendix 2 for phase two of the measurement instrument, which was used in the data collection phase of the study.

Due to the errors identified above and the use of children attending private schools, none of the data from the pilot studies could be included in the main study. This was done to prevent study contamination and thereby maintain the integrity of the study (Van Teijltingen & Hundley, 2002, p.2).

3.5. MEASUREMENT

3.5.1. Definition of measurement

The gross term measurement refers to a process in which concepts are identified within the research phenomenon and converted to a numerical value (Fouché & Bartley, 2012, p.248).

Within this study, it involved determining the performance of children in the revised COs by breaking down their performance into measurable and observable characteristics, which could be quantified into nominal, ordinal and ratio scaling.

3.5.2. Measurement Technique

The measurement technique used in this study was structured observations. This type of measurement technique involves the researcher identifying specific behaviours or events and structuring a measurement instrument which can record these observations, such as a checklist (Brink, Van der Walt & Van Rensburg, 2012, p.150).

3.5.3. A description of the measurement instrument

The measurement instrument was a self-developed information form (see appendix 3). The researcher developed the form by consulting the COs (SAISI,2005), the revised COs (SAISI, 2016) and the adapted format of the COs used by Potgieter (2018). Consultations via skype video call were also held with expert paediatric therapists (qualified in Ayres Sensory Integration® and who had obtained their master's degree in occupational therapy). Lastly, the measurement instrument underwent piloting and two adaptations before it was ready to implement.

The first construct filled into the measurement instrument was the sociodemographic information of the participant. A portion of this data was obtained from the parent consent form and a portion was obtained through structured observations. Identifiable characteristics of the child such as their name and the school which they attended were occluded. The section highlighted in grey on figure 3.1 depicts the demographic data documented on the measurement instrument.

The data collection technique used for the measurement instrument was structured observations (Brink, Van der Merwe & Van Rensburg, 2012, p.150). Structured observations were divided into measurable characteristics and observable characteristics.

Measurable characteristics refer to quantifiable observations which determine concepts, such as frequency and length of time. For example, it may be the

duration in seconds for which a child can maintain a posture in a given subtest. It can also refer to the gradable score of participants in each subtest. The section highlighted in blue on figure 3.1, depicts an example of the measurable characteristics.

Observable characteristics refer to the child’s mannerisms and the technique in which they performed each subtest. Observable characteristics are further divided into Should Have (SH) and Should Not Have (SNH) parameters. SH parameters are indicators that the child is able to accurately perform a given subtest. SNH parameters are indicators that the child may be experiencing some difficulties performing a given subtest. The section highlighted in orange on figure 3.1, depicts an example of observable characteristics.

THE CLINICAL OBSERVATIONS						
This Document was compiled by consulting the Clinical Observations by SAISI (2005), The Clinical Observations of Gross Motor Items by SAISI (2004), the Revised Clinical Observations by SAISI (2016) and telephonic interviews with Ray-Ann Cook (Co-Author of the Clinical Observations of Gross Motor Items, the Revised Clinical Observations and expert paediatric occupational therapist)						
No. of Child:	_____					
DOB of Child:	_____					
Gender of Child:	F / M					
Eye Dominance:	L / R / Not established					
Hand Dominance:	L / R / Not established					
Date of Assessment:	_____/_____/2019					
Key						
HR:	Hyperreactive Response	IA:	Inattentive Behaviour			
BIS:	Bilateral Integration & Sequencing	SNe:	Soft Neurological Sign			
E:	Emotional Reaction	LT:	Low Tone			
PC:	Postural Control	Pr:	Praxis			
V:	Vestibular	Ds:	Discrimination			
Prop:	Proprioception	T:	Tactile			
1.1. ATNR	R ATNR	1	2	3	4	5
	L ATNR	1	2	3	4	5
Degrees R Arm:	_____°		Degrees L Arm: _____°			
Active, L / R differences:	Yes / No					
SH Parameter	Head turned R (Passive)	Head turned L (Passive)				Code
Elbow Flexion ↓ 25°						ATNR1
No changes in joint						ATNR2

Figure 3. 1 A snapshot of the measurement instrument

Key for Figure 3.1:

Demographic Data
Measurable Characteristics
Observable Characteristics

3.5.4. Applying measurement scales to parts the measurement instrument

The researcher made use of nominal, ordinal and ratio scaling in this study. These concepts are discussed, in detail, in the paragraphs below.

Nominal Scaling

Nominal scaling can demonstrate to which group a subject belongs or, in the case of this study, when a characteristic is present or when it is not present (Fouché & Bartley, 2011, p.249). Nominal scaling was applied to the observable characteristics in the study. The researcher used the number '1' to indicate when a characteristic was present and '0' when a characteristic was not present. The section highlighted in blue on Figure 3.2, depicts nominal scaling.

Ordinal Scaling & Ratio Scaling

Both ordinal and ratio scaling were applied to the measurable characteristics in this study.

- a) *Ordinal scaling* orders data according to rank or magnitude (Fouché & Bartley, 2011, p.250). In contrast to nominal scaling, ordinal scaling does not only name a characteristic, but also provides order or rank to several characteristics. Ordinal scaling was applied to the grading of each child's performance in each subtest. This scoring scale is depicted in Table 3.4.

Table 3. 4 Ordinal Scoring criteria of the RCOs

Score	1	2	3	4.	5.
Description	Unable to perform	Makes an attempt but only achieves partially	Able to perform, poor control/not well integrated	Good, slight inconsistencies/lacks some integration	Execute with ease / good control / well integrated /

In the current COs by SAISI (2005), a mere three-point ordinal scale is used. A five-point scale was used in this study to improve the measurement sensitivity by providing an increased ability to discriminate change or differences in the child’s performance, in each subtest (Brink, Van der Merwe & Van Rensburg, 2012, p.174). An example of ordinal scaling is depicted on Figure 3.2 in orange.

b) *Ratio scaling* gives meaning to the distance between values (Fouché & Bartley, 2011, p.250). In ratio scaling, an absolute zero number is present and negative numbers cannot be applied (Fouché & Bartley, 2011, p.250). Ratio measurement was applied to the measurable characteristics which recorded characteristics such as time, repetition and degrees. An example of ratio scaling is depicted on Figure 3.2 in grey.

1. ATNR		R ATNR	1	2	3	4	5
		L ATNR	1	2	3	4	5
Degrees R Arm: <u> 30 </u> °		Degrees L Arm: <u> 35 </u> °					
Active, L / R differences: Yes / No							
SH Parameter	Head turned R (Passive)	Head turned L (Passive)		Code			
Elbow Flexion ↓ 25°	0	0		ATNR1			
No changes in joint position	0	0		ATNR2			
Maintains head position	1	1		ATNR3			

Figure 3. 2 Scales applied to the measurement instrument

Key for Figure 3.2:

Ratio Scaling
Ordinal Scaling
Nominal Scaling

3.6. DATA COLLECTION & MEASUREMENT PROCEDURES

3.6.1. Preparation for data collection process

3.6.1.1. Obtaining permission from participating schools

Schools who met the inclusion criteria were identified via sampling. The researcher sought permission from these schools to take part in the study. All schools requested an English information and permission form, although the forms were available in isiXhosa and Afrikaans (see appendix 4 for the English school information letter and permission form). Confidentiality and anonymity of schools was ensured. The names of schools participating in the study were not specified in the information form. In addition the researcher destroyed permission forms from schools participating in the study to make sure that they could not be identified post data collection.

3.6.1.2. Obtaining consent from parents

The initial plan was to arrange information evenings where parents could be educated about the study and where information forms and consent forms could be distributed. This was not feasible because not all participating schools could accommodate meetings in the evenings, when working parents were available. For this reason, meetings could not be held consistently at all the schools. The researcher resorted to teacher meetings in which the grade R teachers from all the participating schools were educated about the purpose of the study and the method in which they could assist with the return of parent consent forms.

The grade R teachers were provided with enough parent information and consent forms to distribute to parents. Every child attending grade R received these forms and the inclusion criteria was only later refined. All schools participating in the study requested English and isiXhosa parent forms only, although Afrikaans forms were available (see appendix five and six for the English and isiXhosa forms).

Teachers were provided with a recording document on which they could record all the children who had received information and consent forms. They were asked to record the date on which consent forms were sent home and, importantly, the date on which consent forms were returned (see appendix 7). The researcher later used this list, together with the returned consent forms, to determine which children met the inclusion criteria. These forms were destroyed post-data collection as they had personal information pertaining to participants.

School principals were contacted once enough children had been identified who met the criteria for participation. Arrangements were made with the respective school principals and grade R heads regarding the date and time of assessments, allocation of assessment rooms and equipment which the schools needed to supply. Each school was provided with an assessment schedule to ensure that they could diarise assessment times and dates (see appendix 8).

3.6.1.3. Preparation of Interpreters

The researcher was solely responsible for data collection. The researcher did, however, use interpreters to translate instructions to children who were isiXhosa speaking. Two interpreters were needed due to mixed availability because of their work schedules. Both interpreters were working in an administrative role at a private medical practice, this was beneficial as they were familiar with maintaining client confidentiality. Both interpreters were fluent in English and had a matric certificate. The interpreters received training on how to perform administration procedures to maintain consistency with measurement and to prevent research error. Training was held together to prevent the risk of relaying differing information to each interpreter. Interpreters additionally assisted with video recording of assessments. Prior to beginning data collection, interpreters were expected to sign disclosure agreements (see appendix 9 for signed disclosure agreements).

3.6.1.4. Preparation of administration procedures

Finally, the researcher ensured that the administration of each subtest was clearly defined by means of an examiner's manual (see appendix 10). Prior to the commencement of data collection, the researcher studied the administration procedures to prevent errors in administration.

3.6.2. Data Collection Procedures

Figure 3.3 outlines the data collection procedures that the researcher followed for each participant.

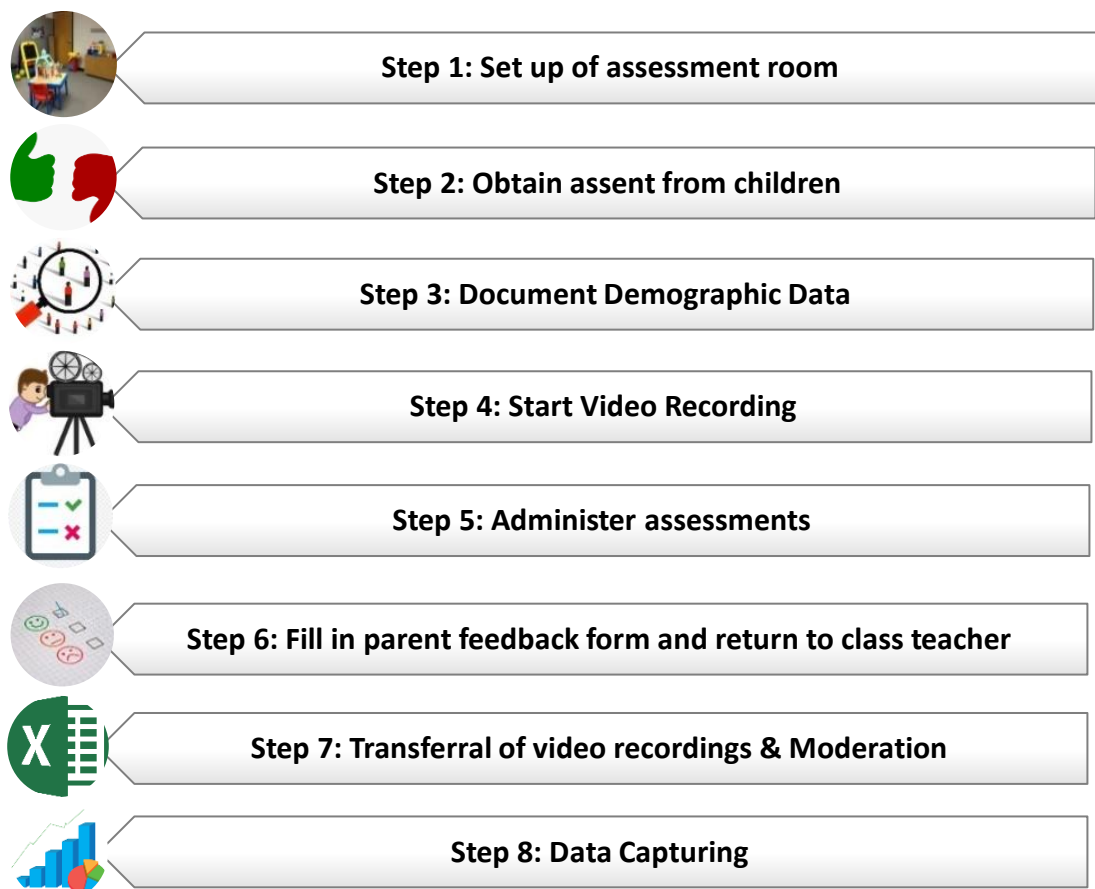


Figure 3. 3 Data collection procedure

Step 1:

- Prior to beginning measurement, the researcher set up the assessment room.
- The assessment rooms were as quiet as possible and well-lit to facilitate active engagement. The researcher removed visual and auditory distractions from the room, where possible.

- The researcher ensured that equipment was set up prior to commencement of measurement.

Step 2:

- Assent was sought from each child eligible to participate in the study by describing the assessment process to the child in their language of preference and providing visual feedback by means of illustrations (see appendix 11).
- At the end of the assent form, a thumbs up and thumbs down face could be found. Children were expected to make an X on the thumbs up smiley face if they chose to participate or an X on the thumbs down smiley face if they did not wish to participate in the study. The researcher demonstrated how to draw an X if the child presented with difficulty copying a X (see appendix 11 for the child assent form).
- The views of the researcher were not forced onto participating children and under no circumstances were children forced to participate in the study.
- Prior to beginning, the researcher checked in with the child. The researcher asked the child whether they needed the bathroom and whether they would like something to drink. This was done to prevent interruptions during assessment.

Step 3:

- The researcher allocated a unique number to each child which was noted on the assessment form as well as on a reusable whiteboard which was video recorded at the start of the video so that assessment forms could be easily referenced to video recordings.
- The researcher then documented the child's demographic data on the assessment form.

Step 4:

- The researcher, with the permission of the child, indicated that the interpreter should begin recording the assessment with a video recorder. The researcher did not emphasise the recording device or the interpreter, to make the assessment environment as natural and as stress-free as possible.

Step 5:

- The researcher administered each subtest and recorded her observations on the information form until all subtests were completed.
- The researcher had a low involvement and a passive stance when recording observations. This meant that instructions relayed to participants remained generic, so that administration procedures could be consistent between participants. The researcher did so to prevent biases and subjectivity from the study that may hinder the reproducibility of the study (Spradley, 1980).
- The researcher closely observed the child and looked for signs that they were paying attention and that they were regulated. If the child suddenly struggled to sit still, struggled to follow instructions, became easily distracted by external stimuli or pulled a face; it became apparent that the child was losing focus. The researcher then provided the child with a brief break. During this break, children were allowed to play in the assessment room or take a bathroom break.
- Once the entire assessment had been completed the researcher stopped the video recording.
- Please note: children were allowed to withdraw from assessment at any point if they wished to do so. In total one child was not able to complete the test administration procedures.
- The researcher then thanked the child for participating in the study. Children were then given a sticker after assessment (this was optional).

Step 6:

- The researcher then filled in a parent feedback form (see appendix 12). The feedback form outlined feedback of the child's performance in the revised COs.
- The feedback form included the contact details of therapists in the area. This was a quick reference for parents if it was indicated that their child needed a comprehensive occupational therapy assessment.
- The researcher then walked with the child back to their classroom.

- The feedback form was given to the teacher in a sealed envelope to put in the child's homework diary to give to their parent(s) or for the teacher to give directly to the parent.

Step 7:

- The video recordings were then transferred to a secure password protected external hard drive.
- The researcher re-watched and re-scored all the video recordings,
- 10% of the total video recordings were moderated by an expert paediatric occupational therapist, qualified in ASI®.
- After moderation, the measurement instrument was amended a second time. See error of measurement for the rationale.
- The researcher then re-watched and re-scored the video recordings with the final amended measurement instrument (see Appendix 13).

Step 8:

- The researcher was solely responsible for capturing all the data. Data was captured on a Windows Excel spreadsheet format.
- The researcher emailed all captured data to the biostatistician for analysis.

3.7. DATA ANALYSIS

Continuous variables were summarised by means, standard deviations or medians and percentiles. Categorical variables were summarised by frequencies and percentages. Group changes were evaluated using appropriate tests and confidence intervals for paired data. Differences between groups were evaluated using appropriate statistical tests and confidence intervals for unpaired data. The analysis was done by the Department of Biostatistics, Faculty of Health Sciences, UFS.

3.8. ERROR OF MEASUREMENT

3.8.1. Introduction

Measurement errors are factors which have the power to impact the validity and the reliability of the study results (Brink, Van der Walt & Van Rensburg, 2012, p.163). In layman's terms validity is the extent to which the study measures what it is supposed to measure and reliability refers to the degree in which the study can measure the same results over time (Delpont & Roestenburg, 2012, p.172-177; Brink, Van der Walt & Van Rensburg, 2012, p.165-169).

3.8.2. Errors of measurement specific to this study

3.8.2.1. Parents participating in the study

The possibility of non-responder bias was considered in this study. The intention was to arrange parent information sessions prior to distributing parent consent forms, but this was not feasible (see section 3.6.1). The researcher arranged information meetings in which teachers were educated about the importance of the study. Teachers were then asked to relay this information to parents. The researcher also recruited teachers who were willing to follow up with parents regarding the return of consent forms. This was done verbally, when parents fetched children from school. The researcher acknowledges that parents were not always able to fetch their children from school. Some educators thus took initiative to phone parents via the school landline. The contact details of parents were never made available to the researcher at any point in the study to maintain their privacy.

3.8.2.2. Children participating in the study

People have inherent biological and social needs (Brink, Van der Walt & Van Rensburg, p.165). According to Maslow's Hierarchy, basic needs include food, water, warmth, rest, security and safety (Maslow, 1970). When participants do not meet their basic needs, it can impact their performance in assessment. The researcher did not conduct assessments during break times and meal times (many schools had feeding schemes). The researcher gave children

breaks if they became distractible or if they required the bathroom. The researcher put these precautions in place to prevent internal distractibility of children during assessment. Internal distractibility could however not be entirely prevented because many learners came from impoverished backgrounds which may have meant some of their psychosocial needs were not met and in turn a degree of internal distractibility was still present.

Participants in the study may have altered their behaviour because of the presence of the researcher, the interpreter and the video camera (Brink, Van der Walt & Van Rensburg, 2012, p.164). This is because participants may have become aware that they were being observed and studied. This is referred to as the Hawthorne effect (Brink, Van der Walt & Van Rensburg, 2012, p.164). The researcher aimed to combat this by trying to make the environment as natural as possible and by not emphasising the video camera. It is also likely that because the researcher was observing performance in tasks and not the natural behaviour in each task, that this would not have had an impact on the study.

Bias may have occurred due to participants lack of openness or impartiality. This refers to the unconscious or conscious tendency of a participant to present themselves in the best possible way. This can cause participants to demonstrate behaviour that is distorted (Brink, Van der Walt & Van Rensburg, 2012, p.98). The researcher tried to make assessment playful and refrained from using words like testing or assessment, in order to prevent this form of bias. Whilst the researcher aimed to provide a comfortable assessment environment, she did consider best level of performance and recorded the child's first response when completing each clinical observation.

Attrition bias, is a type of systematic error. It refers to the drop out of participants in the execution phase of data collection (Nunan, D., Aronson, J.K. & Bankhead, C. 2018). In this study it refers to the drop out of participants during assessment. The researcher prevented drop out by ensuring the assessment setting was as playful and child centred as possible. If participants struggled with maintaining intrinsic motivation during assessment, they were

allowed to place a sticker on the measurement instrument on each subtest which they completed. In total only one participant dropped out of the study. Nunan, Aronson & Bankhead (2017) state that in some cases those who leave a study may have different characteristics to that of participants who were able to complete data collection procedures e.g. dysphoric mood state or in the case of this study previously unidentified developmental delays. It is thus possible that the drop-out of a participant may in fact not have caused bias.

3.8.2.3. Researcher/ Examiner

The researcher was aware that her scoring was subjective and that random error may occur. There was thus a risk that the true ability of a given participant may not be fairly reflected. To address this bias the researcher made use of a number of strategies to ensure that the study accurately reflected the performance of participants in the subtests of the RCOs. Polit and Beck (2008, p.186) refer to this as triangulation.

Intra-rater reliability was tested by repeating scoring on two separate occasions. Intra-rater reliability refers to how consistent the researcher alone is at measuring a constant phenomenon (Brink, Van der Walt & Van Rensburg, 2012, p.170). The purpose of this was to prevent the impact of halo effect, fatigue, prejudice, personal bias which are factors which could threaten the degree of reproducibility of scores assigned for the same set of responses by the same scorer (Baykal, 2015, p.431). The researcher did so by watching video recordings of each child made in the assessment sessions and re-scoring their performance. Videos were only re-watched a month after data collection was completed. This tested the stability of the study, as the consistency of recording results in comparison to in-person measurement, were monitored over time (Brink, Van der Walt & Van Rensburg, 2012, p.170). There was a 90% (minimum) to 100% (maximum) agreement between the scores on the two measurement occasions, which was considered good for this study (Baykal, A., 2015, p.433).

The researcher was the sole person responsible for data collection in this study. This prevented inter-observer variation. The researcher did however consider equivalence reliability. To maintain equivalence reliability, the same results needed to be yielded by different observers (Brink, Van der Walt & Van Rensburg, 2012, p.170). This was done by recruiting an ASI[®] qualified therapist to review 10% of the total assessments completed. The researcher then compared the percentage compatibility between her results and the external examiner. Results indicated that for all subtests, scoring was between 80% (minimum) and 100% (maximum) similar in the measurable and observable results, between the research and the examiner. A minimum of 80% similarity was regarded as acceptable and was thus achieved without the need for adjusting any scores.

The researcher began her ASI[®] qualification through SAISI during the course of the study, and completed the theory course prior to the commencement of data collection. This enhanced the reliability of recording observations, as the researcher was adequately trained to complete the COs by SAISI (2005).

3.8.2.4. Environment

The researcher aimed to conduct assessments at venues which met specific criteria. All the locations where data was collected met the following criteria:

- Spacious
- Quiet
- Well-ventilated
- Well-lighted
- Private
- Comfortable room temperature
- Free from distractions

One study venue was made of corrugated iron. The researcher ensured that assessments were performed at this venue from 08:00 am to 10:00 am. The researcher did so because this venue became unmanageably hot after 10:00

am, thus assessment conditions were not ideal for the participants, the examiner or the interpreter.

3.8.2.5. Measurement instrument

The measurement instrument is non-standardised. This may have caused bias as evidence is not available which supports the reliability nor the validity of the assessment. The researcher put the following precautions in place to improve the validity of the measurement instrument:

a) The researcher clearly defined the administration procedures. The researcher ensured where possible that directions given to all participants were clear and consistent with the administration procedures.

b) Limited research was available on the RCOs. The researcher consulted with professional paediatric therapists and literature to identify observations for each subtest. Next the researcher critically consulted the pilot study to decide which observations should be included in the final measurement instrument. Lastly, the researcher reviewed a prior study, investigating subtests of the Revised COs, by Potgieter (2018), who had already identified observations for the ATNR and the STNR subtests.

c) The measurement instrument was altered with minor changes post data collection after a review from an expert ASI[®] therapist. The researcher did not take the final adjustment of the measurement instrument lightly and the final decision to alter the instrument was made based on maintaining the study integrity. Changes included the addition and removal of observations in the data collection sheet. The researcher was also advised to remove the co-contraction subtest; as an expert ASI[®] therapist posed a concern about the reliability of the administration of the revised procedures performed by the researcher. It should be noted that SAISI still have not finalised the administration for this newly altered subtest. The researcher removed this subtest so that the reliability of the study as a whole would not be compromised. After all changes were made, the researcher re-scored all

participants using this measurement instrument, which was its third adaptation (see Appendix 12, for the final edit of the measurement instrument).

Disclaimer: The revised clinical observations are still being piloted by the SAISI research and training committee. Limited research is available regarding the administration, observations and scoring of each of these subtests. For this reason, the newly added subtests are subject to criticism and adaptation in accordance to clinical reasoning. Minor changes to the measurement instrument are thus not unprecedented.

3.9. ETHICAL CONSIDERATIONS

3.9.1. Consent from Ethic's committees

The researcher obtained permission from the Strategic Planning Policy Research and Secretariat of the EC Department of Education on the 28/01/2019 (Appendix 14). The researcher subsequently obtained permission from the Health Sciences Research and Ethics Committee (HSREC) on the 07/02/2019 (Appendix 15).

3.9.2. Informed Consent

Research participants have the absolute right to informed consent and the right to self-determination (Brink, Van der Walt & Van Rensburg, 2012, p.35).

The researcher ensured that all participant's participating in the study were informed by means of an information letter and by means of verbal instruction. All parties taking part in the study gave voluntary permission, consent or assent.

3.9.2.1. School Principals

The researcher obtained permission from school principals from all the respective schools before approaching grade R teachers, parents and children (see Appendix 4 for the school information letter and permission form). The procedure followed to obtain consent from school principals was as follows:

1. The researcher scheduled meetings with respective school principals in advance and ensured that meetings were arranged at a time which did not interfere with school duties.
2. Prior to the meetings, a school information form and consent form were emailed to each principal or a hard copy (dependent on feasibility, considering some schools were as far as 80km away) was delivered to each respective school principal. This gave them time to read through the information form and consent form prior to the meeting. Although forms were available in English, Afrikaans and isiXhosa, school principals participating in this study only requested English forms (see Appendix 4).
3. The researcher tried to ensure meetings were as efficient as possible and took only roughly 30 minutes per meeting. The researcher explained in detail the purpose and the value of the study. Some school principals filled in the consent form during the meeting, but others required extra time to come to a decision. They were granted this time and not pressured to sign the consent form during the meeting.

3.9.2.2. Parents

Once schools provided permission to continue with the study, all parents participating in the study gave written consent for the children to participate in data collection. See section 3.6.1. for more information regarding the procedure followed to obtain consent from parents (see Appendix five and six for the parent consent form).

3.9.2.3. Children

The researcher acknowledged that children were unable to give informed consent and ensured that only the children, whose parents consented to their participation, took part in the study. Furthermore, children assented to participate in the study and were not coerced to participate in the study (see appendix 11 for the child assent form).

3.9.3. Compensation of interpreter

The interpreters were compensated by the researcher. The interpreter received a market-related remuneration.

3.9.4. Professional Code of Ethics

The researcher kept the core values and standards of the Health Professionals Council of South Africa (HPCSA) in mind when implementing the study (HPCSA, 2008, p.2; Strydom, 2011, p.127):

3.9.4.1. Respect

The researcher *respected* all participants taking part in the study, which included school principals, parents, and children. The researcher demonstrated mutual respect to parties involved in the study by providing documents in their preferred language, namely English, Afrikaans or isiXhosa. The researcher also ensured that information conveyed to school principals and teachers were conveyed in their language of preference. The researcher made use of an interpreter to convey instructions in isiXhosa.

3.9.4.2. Beneficence and Non-Maleficence

The best interests (*beneficence*) of the participants (children) were taken into consideration during the study. The researcher aimed to maintain health and minimise harm (*non-maleficence*) of parties involved in the study. During the course of the study the researcher took the following precautions:

- Assessed children on a mat/soft surface for comfort in case they lose their balance at any point in assessment and to increase comfort when leaning onto bony prominences such as their knees in for point kneeling.

3.9.4.3. Human Rights

The *human rights* of each participant were recognised and protected. The rights of the children partaking in the study were protected and in line with the children's act 38 (2005) which entails:

- The researcher respected the inherent dignity of each child
- Each child was treated fairly and equitably
- The researcher protected each child from unfair discrimination
- The researcher recognised the child's need for development and to engage in play

3.9.4.4. Integrity, Autonomy and Truthfulness

The researcher considered the human rights of each child participating in the study to ensure that she treated them with her utmost *integrity*.

The researcher respected the *autonomy* of children taking part in the study and acknowledged their capacity to give assent. The researcher also respected children who did not wish to complete assessment and terminate their participation in the study.

The researcher maintained a *truthful* stance with all parties taking part in the study. The researcher strived to build professional relationships with participants based on trust. The researcher maintained academic integrity through putting precautions in place to prevent plagiarism. These precautions included checking the authenticity of work by submitting it in Turnitin and ensuring that cited authors were referenced according to the American Psychological Association (APA). In addition, the researcher refrained from reading dissertations with similar research topics. This was to prevent the use of original ideas and to ensure that the study remained authentic to the researcher's voice.

3.9.4.5. Confidentiality

Confidentiality is the act of protecting personal information of research participants (HPCSA, 2008). At all times the private information of participants was handled with strict *confidentiality*. The researcher did not document the private information such as the names and schools' participants were attending. The interpreter signed a disclosure agreement as a further measure to maintain confidentiality of participants.

3.9.4.6. Compassion and Tolerance

The researcher showed *compassion* towards participants and facilitated appropriate comfort and support of participants.

The researcher respected the rights and ethical beliefs of parties involved in the study. The researcher *tolerated* personal, religious and cultural convictions of these persons. At no point did the researcher convey her own personal views or try to alter the views of research participants.

3.9.4.7. Justice and Community

The researcher handled participants in a fair, an impartial and *just* manner. The researcher conveyed relevant information to the schools, parents and children. At no point was false information carried over to research participants. The researcher did so to prevent deception of participants.

The researcher hopes that the study will contribute towards the continuous development in sensory integration assessment within the occupational therapy *community* to improve the identification of sensory integration dysfunction in children.

3.10. SUMMARY

The research population was reduced to a study sample by means of inclusion and exclusion criteria. A sample of 104 children was obtained via stratified random sampling. The measurement instrument was a self-developed information form that was based on the RCOs. Structured observations were recorded. Data was then reviewed by an expert ASI[®] qualified therapist and transcribed onto an excel spreadsheet, which was emailed to the biostatistician, at the University of the Free State for analysis. Descriptive statistics were calculated in terms of medians, frequencies and percentages. Results of measurement will be described in the next paragraph.

CHAPTER 4

STUDY RESULTS

4.1. INTRODUCTION

Chapter 3 gave a detailed description of the methods used to conduct the study. In chapter 4, the results are presented and described. The chapter begins by describing the demographic characteristics of participants in this study. Subsequent parts of the chapter present results in the order of the research objectives, this is depicted in figure 4.1.

4.2. Demographic Data

- Age of Participants
- Gender of Participants
- General Observations

4.3. Results of the Revised Clinical Observations (RCOs) subtest

- Measurable Charecteristics
- Observable Characteristics
- Comparison fo the performance of boys and girls in each subtest

Figure 4. 1 A breakdown of the layout of chapter 4

4.2. DEMOGRAPHIC INFORMATION OF PARTICIPANTS

This section describes the gender, age distribution and dominance of participants. The researcher did not record any other identifiable characteristics of participants to protect their anonymity.

A total of 104 children aged between the five-years-six-months and five-years-11-months participated in the study. Participants attended Grade R during the data collection period. Figure 4.2 depicts the specific age of participants. The gender of participants was specified. The gender distribution of participants was 50 boys (48.08%) and 54 girls (51.92%).

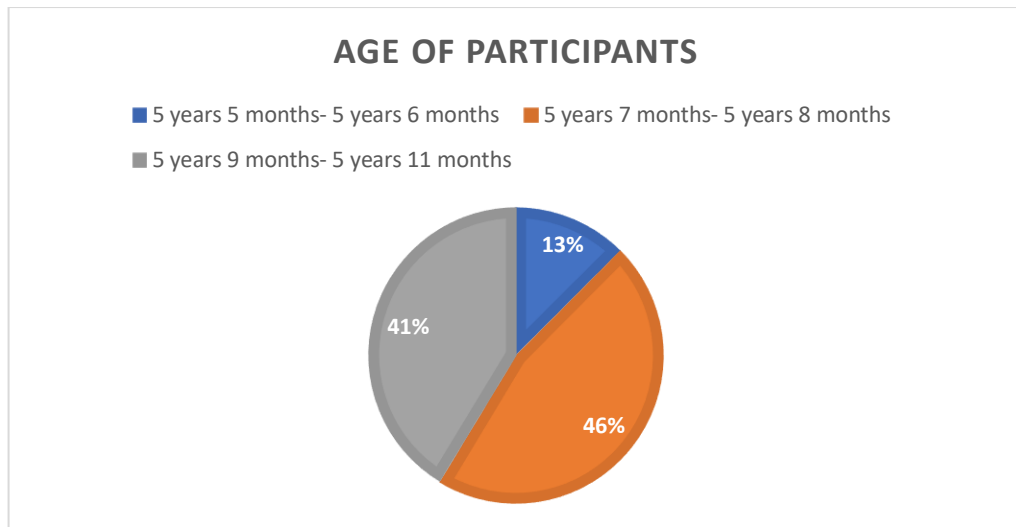


Figure 4. 2 Age distribution of participants

In section 3.8. of Chapter 3, the researcher explained that an external examiner reviewed the video recordings of participant’s execution of the 11 subtests of the RCOs. Upon review, the examiner found administrative errors in three subtests. To maintain the integrity of these results, the researcher removed the scoring of some participants in these three subtests. This altered the total sample of children included in these subtests. These subtests are the Reflex Inhibiting Posture, eye convergence and slow movements. Table five specifies the number of participants that took part in these subtests.

The researcher recorded the hand and eye preference of each participant. The researcher performed these general observations prior to beginning assessment of the 11 RCOs subtests and referred to them as demographic observable characteristics of the study sample. Table 4.1 indicates hand and eye dominance of study participants.

Table 4. 1 Hand and Eye dominance of participants

Demographic Observable Characteristics						
Preference	Boys		Girls		Total Boys & Girls	
	n	%	n	%	Frequency (n)	Percentage (%)
Right hand	45	90	51	94.4	96	92.3
Left hand	5	10	3	5.6	8	7.7
Right eye	23	46	24	44.4	53	51
Left eye	27	54	30	55.6	51	49

This subtest was an indicator of preferred hand and eye use and not a direct indicator of dominance, cf.5.1.

4.3. RESULTS OF THE REVISED CLINICAL OBSERVATIONS (RCOS) SUBTESTS

The researcher will now present the performance of participants for each subtest, on the RCOs. The performance of participants is divided into measurable and observable characteristics (cf. Concept Clarification). For the observable characteristics' observations are characterised into the area of Sensory Integration Dysfunction (SID), neurodevelopmental delay or the differential diagnosis that they can be clustered in, whilst many observations can be clustered into more than one area of dysfunction only the most probable dysfunction(s) are classified for each observation see table 4.2.

Table 4. 2 Classification of observations according to SID, neurodevelopmental delay and differential diagnosis

Abbreviation	Definition
HR:	Hyperreactive Response
IA:	Inattentive Behaviour
BIS:	Bilateral Integration & Sequencing
SNe:	Soft Neurological Sign
E:	Emotional Reaction
LT:	Low Tone
PC:	Postural Control
Pr:	Praxis
V:	Vestibular
Ds:	Discrimination
Prop:	Proprioception
T:	Tactile

The description of performance will be followed by a comparison of gender differences between participants in the performance of participant in each subtest. The Chi Squared Test and Fischer's Exact Test were used to compare the groups. The Chi Squared Test was used in large samples, in which an approximation could be made, in contrast the Fischer's Exact Test was used

as an alternative to the Chi squared Test, when there was a smaller sample and exact procedure needed to be run (Kim, 2016, p.1).

4.3.1. Asymmetrical Tonic Neck Reflex (ATNR) and Reflex Inhibiting Posture (RIP)

4.3.1.1. Measurable Characteristics for the ATNR & RIP Subtest

ATNR

The measurable characteristics represent the grade score of participants and in a stimulated ATNR, the degree of elbow flexion. Table 4.3 depicts the results for grade scoring.

Table 4. 3 Measurable Results of the ANTR

Left ATNR (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
N	%	n	%	n	%	n	%	n	%
32	30.8	37	35.5	24	23.1	11	10.6	0	0
Right ATNR (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
35	33.6	32	30.8	31	29.8	6	5.8	0	0
Degrees by minimums, median and maximums									
Degrees		Minimum		Median		Maximum			
Left ATNR (head turned to the left)		15		44.5		85			
Right ATNR (head turned to the right)		15		45		85			

For the left ATNR 35.5% (n=37) of participants obtained a grade score of 2. Only 10.6% (n=11), obtained a grade score of 4 and no participants obtained a grade score of 5.

For the right ATNR 33.7% (n=35) of participants obtained a grade score of 1. Only 5.8% (n=6) of participants obtained a grade score of 4 and no participants obtained a grade score of 5.

The median degree of elbow flexion for the left ATNR was 44.5°. The median degree of elbow flexion for the right side was 45°. For both the left and right ATNR the interquartile range was between 15° and 85°.

RIP

The researcher critically analysed her own administration of subtests, for each child. She did so by reviewing video footage of assessments, the researcher picked up that she had made an administration error in 33 participants, in the RIP subtest. This mistake was picked up at the beginning of data collection and could be avoided for the remainder of participants in the RIP subtest. The results for the RIP for these 33 participants were not inputted into the data collection sheet. The sample for this subtest only was thus reduced to 71 participants, in place of the sample size of 104 children, found in the remainder of the RCOs subtests in this study. This was a crucial step taken to maintain the integrity of the study.

The measurable characteristics in this subtest are the total grade scores of participants and the time in seconds they managed to hold the RIP.

Table 4.4 depicts the grade scoring of participants in the RIP subtest and a summary of the time in seconds that participants were able to maintain the RIP posture.

Table 4. 4 Measurable Results of the RIP

Left RIP (head turned to the left) n=71									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	N	%	n	%	n	%	n	%
11	15.6	27	38	15	21.1	14	19.7	4	5.6
Right RIP (head turned to the right) n=71									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	N	%	n	%	n	%	n	%
14	19.7	19	26.8	15	21.1	20	28.2	3	4.2
Time is seconds to maintain posture by minimums, median and maximums									
Time in Seconds		Minimum		Median		Maximum			
Left RIP		0		5		33			
Right RIP		0		6		25			

For the left RIP 38% (n=27) of participants obtained a grade score of 2. For the right RIP 26.8% (n=19) of participants obtained a grade score 2 and 28.2% (n=20) of participants obtained a grade score of 4.

The median number of seconds participants could maintain the left RIP was 5 seconds, with an interquartile range of 0-33 seconds. The median number of seconds that participants could maintain the right RIP, was 6 seconds, with an interquartile range of 0-25 seconds.

4.3.1.2. Observable Characteristics for the ATNR & STNR

ATNR

Table 4.5 depicts the observable results for the left and the right ATNR. Observable results are divided into Should Have (SH) parameters, Should Not Have (SNH) parameters and General Observations (GO).

Table 4. 5 Observable Results of the ATNR

SH Parameters	Left ATNR (head turned left) n=104		Right ATNR (head turned right) n=104	
	n	%	n	%
Elbow flexion less 25°	11	10.6	5	4.8
No changes in joint position	6	5.8	3	2.9
Maintains head position	91	87.5	97	93.3
SNH Parameters	Left ATNR (head turned left)		Right ATNR (head turned right)	
	n	%	n	%
Elbow flexion more than 25° (SNe)	93	89.4	99	95.2
Unable to maintain head position (SNe, PC)	13	12.5	7	6.7
Extension of leg on face side (SNe)	1	1	2	1.9
Moves hips over to side (PC)	2	1.9	2	1.9
Loses Balance (PC, V)	2	1.9	2	1.9
Body Swaying (PC, V)	13	12.5	16	15.4
Locks or fixates elbows (PC)	50	48.1	47	45.2
Resistance to head turning (SNe)	17	16.4	21	20.2

Should Have Parameters

Maintenance of head position was possible for 88.5% (n=92) of participants when their head was turned to the left and 93.3% (n=97) of participants when their head was turned to the right.

Should Not Have Parameters

Elbow Flexion more than 25° of the elbow contralateral to the head turned to the left occurred in 89.4% (n=92) participants and 95.2% (n=99) of participants when their head was turned to the right. The tendency to lock elbow occurred

in 48.1% (n=50) of participants in the left ATNR and 45.2% (n=47) of participants in the right ATNR. Resistance to head turning could be observed for 16.4 (n=17) of participants for the left ATNR and 20.2% (n=21) of participants for the right ATNR.

RIP

Table 4.6 depicts the measurable characteristics of participants when performing the left and right RIP.

Table 4. 6 Observable Results of the RIP

SH Parameters	Left RIP (head turned left) n=71		Right RIP (head turned right) n=71	
	n	%	n	%
Maintains head position	35	49.3	26	36.6
Keeps leg straight	6	8.5	15	21.1
Keeps back straight	28	39.4	23	32.4
Leg in line with hip	28	39.4	33	46.5
SNH Parameters	Left RIP (head turned left)		Right RIP (head turned right)	
	n	%	n	%
Body swaying (PC, V)	69	97.2	68	95.8
Unable to maintain head position (PC, SNe)	35	49.3	45	63.4
Unable to maintain arm position (PC, SNe)	20	28.2	19	26.8
Unable to maintain leg extended (PC, SNe)	65	91.6	57	80.3
Curves back (PC)	45	63.4	45	63.4
Retracts chin into shoulder (PC)	28	39.4	24	33.8
Opens shoulders and turns body (PC)	37	52.1	34	47.9
Loses balance (PC, V)	47	66.2	45	63.4
Locks elbows (PC)	27	38	30	42.3
Resistance to head turning (SNe)	18	25.4	17	23.9

Should Have Parameters

Maintenance of head position for a left RIP was possible for 49.3%(n=35) participants and 36.6% (n=26) participants for a right RIP.

Should Not Have Parameters

Body swaying was observed for the left RIP in 63.4% (n=45) of participants and 49.3% (n=35) of participants in the right RIP. Inability to maintain arm position in the left RIP, occurred in 28.2% (n=20) participants and in 26.8%

(n=19) participants in the right RIP. Curving of the back occurred in 63.4% (n=45) participants in the left RIP and in 80.3% (n=57) participants in the right RIP. The tendency of children to retract their chin into their shoulders the left RIP, occurred in 39.4% (n=28) of participants and 33.8%(n=24) participants in the right RIP. The tendency to open and turn the body in the left RIP occurred in 52.1% (n=37) participants and 47.9% (n=34) participants in the right RIP. The tendency to lose their balance in the left RIP was true for 66.2% (n=47) participants and 63.7% (n=45) participants in the right RIP.

4.3.1.1.3. Gender differences for the ATNR and RIP

ATNR

Table 4.7 depicts the gender differences between participants for grade scoring of the left and right ATNR.

Table 4. 7 Gender Differences in the Performance of the ATNR

Gender distribution for the left and right ATNR										
Female (F)					54					
Male (M)					50					
Left ATNR										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	16	29.6	17	31.5	16	29.6	5	9.3	0	0
M	19	38	15	30	15	30	1	2	0	0
p=0.73 (P>0.05)										
Right ATNR										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	N	%	n	%	n	%	n	%
F	14	25.9	21	38.9	13	24.1	6	11.1	0	0
M	18	36	16	32	11	22	5	10	0	0
p=0.45 (p>0.05)										

No statistically significant differences were recorded in the performance of boys and girls in the ATNR subtest.

RIP

Table 4.8 depicts the gender differences between participants when performing the left and right RIP.

Table 4. 8 Gender Differences in the Performance of the RIP

Left RIP (head turned to the left)										
Total Females (F)						38				
Total Males (M)						33				
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	N	%	n	%	n	%	n	%
F	4	10.5	16	42.1	9	23.7	7	18.4	2	5.3
M	6	18.2	11	33.3	6	18.2	7	21.2	2	6.1
p=0.83 (P>0.44)										
Right RIP (head turned to the right)										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	N	%	n	%	n	%	n	%
F	7	18.4	8	21.1	7	15.4	14	36.8	2	5.3
M	7	21.2	11	33.3	8	24.2	6	18.2	1	3
p=0.44 (P>0.44)										

There was no statistically significant difference in the grade scoring of participants in the left and right RIP.

4.3.2. Symmetrical Tonic Neck Reflex (STNR)

4.3.2.1. Measurable Characteristics for the STNR

The measurable characteristics in the STNR subtest refer only to the grade score of participants. Table 4.9 depicts the grade scoring of participants in the STNR Subtest.

Table 4. 9 Measurable Results of the STNR

STNR (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
20	19.2	32	30.8	42	40.4	9	8.7	1	0.9

For the STNR 40.4% (n=42) of participants obtained a grade score of 3. Only 0.9% (n=1) participants obtained a grade score of 5.

4.3.2.2. Observable Characteristics for the STNR

Table 4.10 depicts the observable characteristics present when participants performed the STNR subtest. Observable characteristics are categorised according to observations seen in head flexion and head extension.

Table 4. 10 Observable Results of the STNR

SH Parameters	STNR (Head Flexion)		STNR (Head Extension)	
	n	%	n	%
No Changes in joint position	5	4.8	3	2.9
SNH Parameters	STNR (Head Flexion)		STNR (Head Extension)	
	n	%	n	%
Unable to maintain head position (PC)	8	7.7	7	6.7
Elbow flexion (SNe)	86	82.7		
Rounded back (SNe)	50	48.1		
Posterior pelvic tilt (SNe)	82	78.9		
Cannot hold position when head in flexion (SNe, PC)	24	23.1		
Hyperextension of elbows (SNe)			83	79.8
Lordosis (SNe)			88	84.5
Anterior pelvic tilt (SNe)			88	84.5
Cannot hold position when head in extension, or goes onto haunches (SNe, PC)			19	18.3
Locks Elbows (PC)	44	42.3	35	33.7
Resistance Head Turning (SNe)	37	35.6	27	26

Should Have Parameters

No changes in joint position with head flexion occurred 4.8% (n=5) of participants and 2.9% (n=3) participants in head extension.

Should Not Have Parameters

In head flexion, elbow flexion occurred in 82.7% (n=86) participants, a rounded back occurred in 48.1% (n=50) participants, a posterior pelvic tilt occurred in 78.9% (n=82) of participants and lastly the inability to maintain the position with head flexion occurred in 23.1%(n=24) of participants.

In head extension, hyperextension of elbows occurred in 79.8% (n=83) of participants, lordosis occurred in 84.5% (n=88) participants, an anterior pelvic tilt occurred in 84.5% (n=88) participants and finally then inability of participants to hold their position in head extension occurred in 18.3% (n=19) participants.

The tendency to lock elbows in head flexion occurred in 42.3% (n=44) participants and 33.7% (n=35) participants in head extension. Resistance to head turning in head extension occurred in 35.6% (n=37) participants and 26% (n=27) participants in head flexion.

4.3.2.3. Gender Differences for the STNR

Table 4.11 demonstrates gender differences between boys and girls in the grade scoring of the STNR.

Table 4. 11 Gender Differences in the Performance of the STNR

STNR										
Total Females (F)						54				
Total Males (M)						50				
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	7	13	18	33.3	24	44.4	4	7.4	1	1.9
M	13	26	14	28	18	36	5	10	0	0
p=0.38 (P>0.05)										

There was no statistically significant difference in the grade scoring of boys and girls in the STNR subtest.

4.3.3. Bilateral Ball Hitting (BBH)

4.3.4.2. Measurable Characteristics for BBH

The measurable characteristics in the BBH subtest refer only to the grade scoring of participants. Table 4.12 depicts the grade scoring of participants when performing the BBH subtest.

Table 4. 12 Measurable Results for BBH

Left Bilateral Ball Hitting (BBH)										
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		
n	%	n	%	N	%	n	%	n	%	
5	4.8	8	7.7	9	8.7	18	17.3	64	61.5	
Right BBH										
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		
n	%	n	%	N	%	n	%	n	%	
6	5.8	3	2.9	8	7.7	19	18.2	68	65.4	

For the BBH subtest 61.5% (n=64) of participants obtained a grade score 5 in the left BBH of and 65.4% (n=68) participants obtained a grade score of 5.

4.3.4.2. Observable Characteristics for BBH

Table 4.13 depicts the observable characteristics present of participants when performing the BBH subtest. Results consider midline crossing on both the left and the right side of the child's body.

Table 4. 13 Observable Results for BBH

SH Parameters	Left BBH		Right BBH	
	n	%	n	%
Makes use of midline crossing	84	80.8	92	88.5
Does not let go of foil roll	101	97.1	102	98.1
Elbow flexion and extension	85	81.7	88	84.6
Smooth Arm Movements	79	76	80	76.9
Able to follow instructions	101	97.1	102	98.1
SNH Parameters	Left BBH		Right BBH	
	n	%	n	%
Shifts bum and body to bring ball back into the midline (BIS)	39	37.5	32	30.8
Avoidance reaction to ball (D)	17	16.4	15	14.4
Let's go of foil roll (BIS)	3	2.9	2	1.9
Maintains elbows extended (BIS)	19	18.3	16	15.4
Rigid arm movements (BIS)	24	23.1	24	23.1
Unable to follow instructions/ requires instructions to be repeated (IA)	3	2.9	2	1.9
Associative reaction of mouth (SNe)	34	32.7	31	29.8

Should Have Parameters

Of the total study sample 80.8% (n=84) participants could perform midline crossing to the left side of their body and 88.5% (n=92) participants could perform midline crossing to the right side of their body for left BBH 97.1% (n=101) participants did not let go of the foil roll and 98.1% (n=102) participants did not let go for the right BBH. Elbow Flexion and extension could be performed in the left BBH by 81.7%(n=85) participants and 84.6%(n=88) participants in the right BBH. Smooth Arm movements were observed for 76% (n=79) participants in the left BBH and 76.9% (n=80) participants in the right BBH. For this subtest, 97.1% and 98.1% respectively of participants were able to follow instructions given by the examiner.

Should Not Have Parameters

For the left BBH, 37.5% (n=39) children tended to shift their bum to bring it to the midline and 30.8% (n=32) did so for the right BBH. Rigid arm movements could be observed for 23.1% (n=24) participants in the left BBH and right BBH. Associative reactions of mouth were observed by 32.7% (n=34) participants in the left BBH and 29.8% (n=31) participants in the right BBH.

4.3.4.3. Gender Differences for BBH

Table 4.14 depicts marginal gender differences in the performance of participant's in both the left and right BBH subtest.

Table 4. 14 Gender Differences in Performance in the BBH subtest

Total Females (F)		54									
Total Males (M)		50									
Left Bilateral Ball Hitting (BBH)											
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		
	N	%	N	%	n	%	n	%	n	%	
F	4	7.4	4	7.4	5	9.3	6	11.1	35	64.8	
M	1	2	4	8	4	8	12	24	29	58	
p=0.37 (P>0.05)											
Right BBH											
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		
	N	%	N	%	n	%	n	%	n	%	
F	3	5.5	2	3.7	5	9.3	7	13	37	68.5	
M	3	6	1	2	3	6	12	24	31	62	
0.67 (P>0.05)											

No statistically significant difference was found in the performance of boys and girls in both the BBH subtest.

4.3.4. Tactile Touch Accuracy (TTA)

4.3.4.1. Measurable Characteristics for TTA

The measurable characteristics in the TTA subtest refers to the grade scoring of participants and the number of locations, the child could identify on their hand and forearm with the occlusion of visual stimuli.

Table 4.15 depicts the grade scoring of participants and the number of body parts participants were accurately able to identify in the TTA subtest.

Table 4. 15 Measurable Results of for TTA

Tactile Touch Accuracy (TTA) (n=104)										
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5		
n	%	n	%	n	%	n	%	n	%	
12	11.5	8	7.7	50	48.1	2	1.9	32	30.8	
No. Body Parts identified				N				%		
0				12				11.5		
1				8				7.7		
2				18				17.3		
3				32				30.8		
4				34				32.7		

In the TTA subtest 48.1% (n=50) of participants obtained a grade score of 3. The frequency of participants to identify 4 body parts was 34 which worked out to 32.7% of participants.

4.3.4.2. Observable Characteristics for TTA

Table 4.16 depicts the observable characteristics of participants, present, when performing the TTA subtest. Observable characteristics are specified for each location the child was expected to identify, on their hand and forearm, with the occlusion of visual stimuli. These include the index finger, forearm, thumb and dorsal aspect of the forearm. General observations are observations which could be noted throughout the TTA subtest.

Table 4. 16 Observable Results for TTA

SH Parameter	Index Finger		Fore-arm		Thumb		Dorsal aspect of forearm	
	n	%	n	%	n	%	n	%
Able to identify location	69	66.4	67	64.4	73	70.2	73	70.2
SNH Parameter	Index Finger		Fore-arm		Thumb		Dorsal aspect of forearm	
	n	%	n	%	n	%	n	%
Inaccurate pointing to body part	35	33.7	37	35.6	31	29.8	31	29.8
Delayed response to touch (Takes 5 seconds or more to react)	13	12.5	14	13.5	5	4.8	9	8.7
Uses verbal prompts to try and identify body parts	0	0	0	0	0	0	0	0
General SNH Parameters								
	n				%			
Rubs or scratches on the location where the examiner touches	27				26			
Decreased eye contact	45				43.3			
Cries	1				0.9			
Hitting	2				1.9			
Pulled Face	25				24			
Moaned	1				0.9			
Refusal to participate in activity	0				0			
Difficulty Sustaining Attention	1				0.9			
Does not listen when spoken to directly	1				0.9			
Does not follow instructions	1				0.9			
Resistant to complete activity	0				0			
Distracted by external stimuli	0				0			
Fidgets	0				0			
Struggles to maintain a seated position	0				0			
Tries to get up	0				0			
Talks excessively	0				0			

Should Have Parameters

Accurate identification of the index finger was observed for 66.4% (n=69) participants, 64.4% (n=67) participants could accurately identify their fore-arm, 70.2% (n=73) participants could accurately identify their thumb and 70.2% (n=73) participants could accurately identify the dorsal aspect of their forearm.

Should Not Have Parameters

Inaccurate pointing to the index finger could be observed for 33.7% (n=35) participants, for the fore-arm it could be observed for 35.6% (n=37) participants, for the thumb it could be observed for 29.8% (n=31) participants and for the dorsal aspect of the forearm it could be observed for 29.8% (n=31) participants.

General SNH Parameters

General observations recorded whether participants presented with tactile defensive, emotional, inattentive and or hyperactive behaviour(s). The tendency to rub or scratch the location the examiner provided the tactile stimulus was observed for 26% (n=27) participants. Decreased eye contact could be observed for 43.3% (n=45) participants. Pulling of face was observed for 24% (n=25) participants. Moaning was observed for 1% (n=0.9) participants. No participants refused to participate in the activity.

4.3.4.3. Gender differences in performance for TTA

Table 4.17 depicts the gender differences, in the performance of participants, in the TTA subtest.

Table 4. 17 Gender Differences in Performance in TTA

Tactile Touch Accuracy (TTA)										
Total Females (F)					54					
Total Males (M)					50					
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	N	%	N	%	n	%
F	4	7.41	4	7.41	6	11.11	20	37.04	20	37.04
M	8	16	4	8	12	24	12	24	14	28
p=0.67 (P>0.05)										

There was no statistically significant gender difference, in the performance of boys and girls in the TTA subtest.

4.3.5. Tactile Perception (TP)

4.3.5.1. Measurable Characteristics for TP

The measurable characteristics refer to the grade scoring of participants in the TP subtest and the median number of 3D and 2D objects participants could identify with the occlusion of visual stimuli. Table 4.18 depicts the grade score and number of objects participants were able to identify in the Tactile Perception (TP) subtest.

Table 4. 18 Measurable Results for TP

TP- 3D Objects (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
0	0	0	0	2	1.92	78	75	24	23.08
TP- 2D Objects (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
0	0	3	2.88	22	21.15	64	61.54	15	14.42
No. Objects identified		2D Objects			3D Objects				
		n	%	n	%				
1		0	0	1	0.9				
2		0	0	1	0.9				
3		0	0	5	4.8				
4		2	1.9	17	16.4				
5		15	14.4	39	37.5				
6		87	83.7	41	39.4				

A grade score of 4 was obtained by 75% (n=78) of participants in the 3D portion and 61.5% (n=64) of participants in the 2D portion. In the 3D portion of the subtest 83.7% (n=87) of participants identified six objects and in the 2D portion, 39.4% (n=41) of participants identified six objects.

4.3.5.2. Observable Characteristics for TP

Observable characteristics are recorded individually for the performance of participants when identifying 3D objects and then when identifying 2D objects. Table 4.19 depicts the observable characteristics of participants, present, when performing the TP subtest.

Table 4. 19 Observable Results for TP

SH Parameters	3D Objects		2D Objects	
	n	%	n	%
Can listen and follow instructions	86	82.7	100	96.2
Able to complete the entire activity	104	100	104	100
SNH Parameters	3D Objects		2D Objects	
	n	%	n	%
Attempts to look inside box (Prop, T, Ds)	58	55.8	57	54.8
Difficulty finding object in box (Prop, T, Ds)	56	53.9	54	51.9
Tries to redo initial try/ Compensates for mistakes (Prop, T, Ds)	1	0.9	11	10.6
General SNH Parameters				
	n		%	
Resistant to put hand or hands in box (TD)	14		13.5	
Does not want to maintain hand or hands in box (TD)	61		58.7	
Shy to interact with activity or avoidant (TD/E)	24		23.1	
Appears confused by the activity	29		27.9	
Explosive emotions or anxiety (TD/E)	28		26.9	
Refusal to complete activity (TD/E)	0		0	
Associative Reaction of Mouth (SNe)	35		33.7	
Decreased eye contact (TD/E)	17		16.4	
Difficulty Sustaining Attention (IA)	11		10.6	
Does not listen when spoken to directly (IA)	7		6.7	
Does not follow instructions (IA)	21		20.2	
Resistant to complete activity (IA)	2		1.9	
Distracted by external stimuli (IA)	5		4.8	
Fidgets (HR)	3		2.9	
Struggles to maintain a seated position (HR)	15		14.4	
Tries to get up (HR)	1		0.9	
Talks excessively (HR)	4		3.9	

Should Have Parameters

When identifying 3D objects, 82.7% (n=86) participants could listen and follow instructions and 96.2% (n=100) could do so when identifying 2D objects. All participants were able to complete the entire activity in the 3D and 2D sections.

Should Not Have Parameters

Attempting to look inside the box could be observed for 55.8% (n=58) participants in the 3D portion of the subtest and 54.8% (n=57) participants in the 2D portion of the subtest. Difficulty finding objects in the box was observed for 53.9% (n=56) participants in the 3D portion of the subtest and 51.9% (n=54) participants in the 2D portion of the subtest.

General SNH Parameters

Similarly, to the TTA subtest this subtest includes general observations which observe tactile defensive, emotional, inattentive and hyperactive behaviour. It was observed that 13.5% (n=14) participants were resistant to put their hands in the box and that 58.7% (n=61) participants did not want to maintain their hand in the box. The observation of being shy or avoidant to interact in the activity was noted for 23.1% (n=24) participants and the appearance of confusion by participants was noted for 27.9% (n=29) participants. Explosive emotions or anxiety could be observed for 26.9% (n=28) participants. An associative reaction of mouth was observed for 33.7% (n=35) participants. Not following instructions could be observed for 20.2% (n=21) participants.

4.3.5.3. Gender differences in performance for TP

Table 4.20 depicts gender differences between participants in the TP subtest.

Table 4. 20 Gender Differences in Performance of TP

Tactile Perception										
Total Females (F)						54				
Total Males (M)						50				
3D Objects										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	0	0	0	0	1	1.8	39	70.4	15	27.8
M	0	0	0	0	1	2	40	80	9	18
p=0.49 (P>0.05)										
2D Objects										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	0	0	2	3.6	11	20.4	32	59.3	9	16.7
M	0	0	1	2	11	22	32	64	6	12
p=0.88 (P>0.05)										

No statistically significant differences were identified between boys and girls in the performance of the 3D and 2D portions of this subtest.

4.3.6. Proximal Joint Stability (PJS)

4.3.6.1. Measurable Characteristics for PJS

The measurable characteristics in the PJS refer to the grade scoring of participants in all the sections of this subtest. Table 4.21 depicts the grade

scoring of participants in the Proximal Joint Stability (PJS) subtest. Left right differences when performing the subtest are also depicted.

Table 4. 21 Measurable Results for PJS

PJS Left hip and shoulder (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	N	%
1	0.9	9	8.7	15	14.4	27	26	52	50
PJS Right hip and shoulder (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
5	4.8	11	10.6	18	17.3	30	28.9	40	38.5
PJS Anterior (hips) (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
0	0	1	0.9	21	20.2	50	48.1	32	30.8
PJS Posterior (Shoulders) (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
1	0.9	1	0.9	17	16.4	45	43.3	40	38.5

For the left hip and shoulder portion of the subtest 50% (n=52) participants obtained a grade score of 5. In the right hip and shoulder portion 38.5% (n=40) participants obtained a grade score of 5. For the movement anterior to the hips 48.1% (n=50) participants obtained a grade score of 4 and for the posterior movement at the shoulders 43.3% (n=45) participants obtained a grade score of 4.

4.3.6.2. Observable Characteristics for PJS

The observable characteristics refer to the performance of participants in all the individual joints, investigated in this subtest. Table 4.22 depicts observable characteristics of participants, present, when performing the PJS subtest.

Table 4. 22 Observable results of the PJS subtest

SH Parameter	Left Hip and Shoulder (LHS)		Right Hip and Shoulder (RHS)		Anterior to hips (AH)		Posterior to shoulders (PS)	
	n	%	n	%	n	%	n	%
No changes in posture	41	39.4	53	51	35	33.7	39	37.5
Maintains balance	85	81.7	95	91.4	98	94.2	97	93.3
SNH Parameter	Left Hip and Shoulder (LHS)		Right Hip and Shoulder (RHS)		Anterior to hips (AH)		Posterior to shoulders (PS)	
	n	%	n	%	n	%	n	%
Joints move in the direction of force	62	59.6	49	47.1	70	67.3	60	57.7
Fixation of upper limbs	35	33.7	35	33.7	39	37.5	36	34.6
Hyperextension of elbows	8	7.7	6	5.8	8	7.7	7	6.7
Elbow flexion	16	15.4	12	11.5	2	1.9	2	1.9
Crossing of ankles	8	7.7	8	7.7	7	6.7	7	6.7
Widens base of support	1	1	2	1.9	2	1.9	3	2.9
Does not weight bear on all four limbs	23	22.1	19	18.3	11	10.6	6	5.8
Loses balance	20	19.2	10	9.6	3	2.9	3	2.9
Moves hips over to side	29	27.9	21	20.2	1	1	2	1.9
Falls back onto haunches							9	8.7
Lordosis	4	3.9	3	2.9	8	7.7	4	3.9
Rounded Back	25	24	23	22.1	36	34.6	31	29.8

Should Have Parameters

No changes in posture were observed for 39.4% (n=41) of participants when a force was exerted on the left hip and shoulder, 51% (n=53) of participants when a force was exerted on the right hip and shoulders, 33.7% (n=35) of participants when an anterior force was exerted on the hips and 37.5% (n=39) of participants when a posterior force was exerted on the shoulders. The ability to maintain balance could be observed for 81.7% (n=85), when a force was exerted at the left hip and shoulder, 91.4% (n=95) participants when a force was exerted at the right hip and shoulder, 94.2% (n=98) participants when an anterior force is exerted at the hips and 93.3% (n=97) participants when a posterior force is exerted at the shoulders.

Should not have parameters

Movements at the joints in the direction of the force could be observed for 59.6% (n=62) participants at the left hip and shoulders (LHSs), 47.1% (n=49) participants at the right hip and shoulders (RHSs), 67.3% (n=70) participants in the anterior direction at the hips (AH) and 57.7% (n=60) participants in the posterior direction at the shoulders (PSs).

Fixation at the upper limbs could be observed for 33.7% (n=35) participants at the left hip and shoulders, 33.7% (n=35) participants at the RHSs, 37.5% (n=39) participants at the LHSs, 67.3% (n=70) participants in the AHs and 57.7% (n=60) participants in the PSs.

Not being able to weight bear on all four joints in the four-point-kneeling position, when a force was applied in the direction of the left hip and shoulder could be observed in 22.1% (n=23) participants, for 18.3% (n=19) participants when the movement was in the direction of the right hip and shoulders, 10.6% (n=11) participants when the movement was anterior of the hips and 5.8% (n=6) participants when the movement was posterior to the shoulders.

Movement of hips to the side, could be observed when a force was applied to the left hip and shoulders in 27.9% (n=29) participants and in 20.2% (n=21) participants when the movement was in the direction of the right hip and shoulders, results were insignificant for movement anterior to the hips and posterior to the shoulders.

Rounding of back could be observed for movements towards the LHS in 24% (n=25) participants, 22.1% (n=23) participants towards the RHS, 34.6% (n=36) participants towards AHs and 29.8% (n=31) towards PSs.

4.3.6.3. Gender differences in performance for PJS

Table 4.23 depicts gender differences in the performance of participants, in the PJS subtest.

Table 4. 23 Gender differences between participants in the PJS subtest

Proximal Joint Stability (PJS)										
Total Females (F)						54				
Total Males (M)						50				
Left Hip and shoulder										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	3	5.6	7	13	9	16.7	16	29.6	19	35.2
M	2	4	4	8	9	18	14	28	21	42
p=0.89 (P>0.05)										
Right Hip and Shoulder										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	1	1.9	6	1.1	.8	14.8	12	22.2	27	50
M	0	0	3	6	7	14	15	30	25	50
p=0.75 (P>0.05)										
Anterior to the hips										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	0	0	1	1.9	10	18.5	26	48.2	17	31.48
M	0	0	0	0	11	22	24	48	15	30
0.97 (P>0.05)										
Posterior to the shoulders										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	0	0	1	1.9	9	16.7	22	40.7	22	40.7
M	1	2	0	0	8	16	23	46	18	36
p=0.89 (P>0.05)										

No statistically significant differences could be drawn between boys and girls in all sections of the PJS subtest.

4.3.7. Slow Movements (SM)

4.3.7.1. Measurable Characteristics for SM

Due to the researcher omitting the administration of 1 participant in this subtest, the total sample for this subtest was 103 children. The measurable characteristics of participants in this subtest refer to grade scoring and the time in seconds, children took to perform the slow movements action.

Table 4.24 depicts the grade scoring and the number of seconds participants take to perform the SM subtest.

Table 4. 24 Measurable results of the SM subtest

Slow Movements (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
2	1.9	30	29.1	41	39.8	9	8.7	21	20.4
Time Taken according to interquartile range									
		Minimum		Median				Maximum	
Time in Second		5		10				37	

In the SM subtest 39.8% (n=41) of participants obtained a grade score of 3. A median time of 10 seconds was taken to complete the SMs.

4.3.7.2. Observable Characteristics for SM

Table 4.25 depicts the observable characteristics of participants, present, when performing the SM subtest.

Table 4. 25 Observable results of the SM subtest

Hand which Arrives first					
Left		Right		Both	
N	%	n	%	n	%
21	20.4	1	1	81	78.6
SH Parameters			Slow Movements		
			n	%	
Well controlled Shoulder movement			56	54.4	
Smooth and fluid movement			58	56.3	
Full elbow extension			79	76.7	
Shoulder abduction to 90°			79	76.7	
SNH Parameters			Slow Movements		
			n	%	
Some left right differences (BIS, PC)			83	79.8	
Shoulders dropping (PC, P, Ds)			47	45.6	
Rigid arm movements (BIS)			45	43.7	
Did not fully extend elbows (BIS, P, Ds)			24	23.3	
Did not fully abduct shoulders to 90° (PC, P, Ds)			24	23.3	
Visually monitors movement (P)			28	27.2	
Associative reactions with mouth (SNe)			56	54.4	
Unable to maintain feet flat on floor (PC)			19	18.5	
Crossing of ankles (PC)			7	6.8	
Widens base of support (PC)			14	13.6	
Slouched seated posture (PC)			28	27.2	

In 78.6% (n=81) of participants both hands returned bilaterally in this subtest, 20.4% (n=21) participant's left hand returned first and only 1% (n=1) of participant's right hand returned first.

Shoulder Have Parameters

Well controlled shoulder movement was observed in 52.4% (n=54) participants. Smooth and Fluid movement could be observed in 56.3% (n=58)

participants. Full elbow extension and shoulder abduction to 90° could be observed in 76.7% (n=79) of participants.

Should Not Have Parameters

Some left right differences could be observed in 79.8% (n=83) participants. Shoulders dropping was observed in 45.6% (n=47) participants. Rigid arm movements were observed in 43.7 (n=45) participants. Not fully extending elbows and abducting shoulders to 90° was observed in 23.3% (n=24) participants. Visually monitoring of arm movements could be observed in 27.2 (n=28) participants. An associative reaction of the mouth could be observed in 54.4% (n=56) participants. Slouching in the seated posture could be observed in 27.2 (n=28) participants.

4.3.7.3. Gender differences in performance for SM

Table 4.26 depicts gender differences between participants in the SM subtest.

Table 4. 26 Gender differences between participants in SM subtest

Slow Movements (SM)										
Total Females (F)						54				
Total Males (M)						49				
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	1	1.9	17	31.5	20	37	5	9.3	11	20.4
M	1	2	13	26.5	21	42.9	4	8.2	10	20.4
p=0.96 (P>0.05)										

No statistically significant differences between boys and girls could be found, in the performance of the SM subtest.

4.3.9. Eye Tracking (ET)

4.3.9.1. Measurable Characteristics for ET

The measurable characteristics refer to the grade scoring of participants in all the individual sections of the eye tracking subtest. Table 4.27 depicts the grade scoring of participants when performing the Eye Tracking (ET) subtest. Please take note that the total number of participants that took part in the convergence subtest was 103 participants, due to the examiner omitting the administration

of one participant in this portion of the subtest. All remaining sections of this subtest had a study sample of 104 participants.

Table 4. 27 Measurable results of the ET subtest

Visual Pursuits (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
3	2.9	12	11.5	14	13.5	38	36.5	37	35.6
Midline Crossing both eyes (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
4	3.9	11	10.6	11	10.6	18	17.3	60	57.7
Midline Crossing left eye (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
5	4.8	15	14.4	22	21.2	23	22.1	39	37.5
Midline Crossing right eye (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	N	%	n	%	n	%
6	5.8	18	17.3	14	13.5	24	23.1	42	40.4
Convergence (n=103)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	N	%	n	%	n	%
3	2.9	20	19.4	17	16.5	28	27.2	35	34
Quick Localisation (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	N	%	n	%	n	%
1	0.9	3	2.9	17	16.4	38	36.5	45	43.3

In the visual pursuits portion of this subtest, 36.5% (n=38) of participants obtained a grade score of 4. In the midline crossing portion of the subtest the following participants obtained a grade score of 5: 57.7% (n=60) of participants for bilateral midline crossing, and 37.5% (n=35) of participants for midline crossing of the left eye and 40.4% (n=42) of participants for midline crossing of the right eye.

4.3.8.1.2. Observable Characteristics for ET

Table 4.28 depicts the frequency and percentages that participants were able to complete left and right independent eye closure and the observable characteristics of participants, present, when performing the ET subtest.

Table 4. 28 Observable results of the ET subtest

SH Parameter	Visual Pursuits		Midline Crossing (Both eyes)		Midline Crossing (Right eye)		Midline Crossing (left eye)	
	n	%	N	%	N	%	n	%
Visual fixation on object	82	78.9	83	79.8	70	67.3	74	71.2
Smooth coordinated eye movements	69	66.4	80	76.9	49	47.1	51	49
Eyes move independently from head	64	61.5	81	77.9	97	93.3	95	91.4
SNH Parameter	Visual Pursuits		Midline Crossing (Both eyes)		Midline Crossing (Right eye)		Midline Crossing (left eye)	
	n	%	N	%	n	%	n	%
Difficulty fixating on object	22	21.2						
Rigid movement	35	33.7	21	20.2	34	32.7	32	30.8
Loses focus when crossing the midline			24	23.1	55	52.9	53	51
Makes use of head movements	40	38.5	23	22.1	7	6.7	9	8.7
SH Parameter	Convergence		Quick Localisation					
	n	%	n	%				
Visual fixation on object	68	66	94	90.4				
Smooth coordinated eye movements	50	48.5	83	79.8				
Eyes move independently from head	97	94.2	57	54.8				
SNH Parameter	Convergence		Quick Localisation					
	n	%	n	%				
Difficulty fixating on object	34	33	10	9.6				
Rigid movement	53	51.5	21	20.2				
Makes use of head movements	7	6.8	48	46.2				
General SNH Parameters								
		N	%					
Excessive Blinking		41	39.4					
Eyes water		24	23.1					
Associative reaction of mouth (SNe)		45	43.3					
Slouches in seat (PC)		30	28.9					

Should Have Parameters

Visual fixation on the object used for tracking could be observed in 78.9% (n=83) of participants in the visual fixation section, 79.8% (n=83) of participants in the midline crossing with both eyes, 67.3% (n=70) participants in the midline crossing of the right eye and 71.15% (n=74) of participants in the midline crossing of the left eye. Smooth Coordinated eye movement could be observed in 66.4% (n=69) of participants in the visual pursuits section, 76.9% (n=80) participants in midline crossing with both eyes, 47.1% (n=49) of participants in right midline crossing and 49% (n=51) participants in left midline crossing. Eye movement independently of head could be observed in 61.5% (n=64) participants in the visual pursuits section, 77.9% (n=81) of participants in the midline crossing with both eyes, 93.2% (n=97) of participants in midline crossing with the right eye and 91.4% (n=95) participants in midline crossing with the left eye.

Visual fixation of the object which participants tracked in the convergence subtest could be observed in 66% (n=68) participants and 90.4% (n=94) of participants in the quick localisation subtest. Smooth coordinated eye movements in the convergence subtest could be observed in 48.5% (n=50) participants and 79.8% (n=83) participants in the quick localisation subtest. Eyes moving independently of head could be observed in 94.2% (n=97) participants in the convergence subtest and 48.8% (n=57) participants in the quick pursuit's subtest.

Should Not Have Parameters

Difficulty fixating on the object tracked could be observed in 21.2% (n=22) of participants in the visual pursuits section. Rigid eye movements could be observed in 66.4% (n=69) participants in the visual pursuits section of this subtest, 20.2% (n=21) participants when crossing the midline with both eyes, 52.9% (n=55) participants when crossing the midline with their right eye and 51% (n=53) participants when crossing the midline with their right eye. Losing focus when crossing the midline could be observed in 23.1% (n=24) participants when crossing the midline with both eyes, 52.9% (n=55) participants when crossing the midline with the right eye and 51% (n=53) participants when crossing the midline with the left eye. The tendency to make use of head movements could be observed in 38.5% (n=40) participants in the visual pursuits section, 22.1% (n=23) participants when performing midline crossing with both eyes, 6.7% (n=7) participants when crossing the midline with the right eye and 8.7% (n=9) participants when crossing the midline with the left eye.

In the convergence subtest difficulty fixating on object could be observed in 33% (n=34) participants and 9.6% (n=10) participants in the quick localisation subtest. Rigid eye movements could be observed in 51.5% (n=53) participants in the convergence section and 20.2% (n=21) participants in the quick localisation section. The tendency to make use of head movements could be observed in 6.8% (n=7) participants in the convergence section and 46.2% (n=48) participants in the quick localisation section.

General SNH Parameters

Excessive blinking could be observed in 39.4% (n=41) participants. Eye watering was observed in 23.1% (n=24) participants.

An associative reaction of mouth was observed in 43.3% (n=45) participants and slouching in the seat was observed in 28.9% (n=30) participants.

4.3.8.3. Gender differences in performance

Table 4.29 depicts the gender differences between participants in each component of the eye movements subtest.

Table 4. 29 Gender differences between participants in the ET subtest

Eye Movements (except Convergence)										
Total Females (F)						54				
Total Males (M)						50				
Visual Pursuits										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	2	3.7	4	7.4	3	5.6	18	33.3	27	50
M	1	2	8	16	11	22	20	4	10	20
p=*0.01 (P<0.05)										
Midline Crossing Both Eyes										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	2	3.7	3	5.6	5	9.3	8	14.8	36	66.7
M	2	4	8	16	6	12	10	20	24	48
p=0.30 (P>0.05)										
Midline Crossing of Right Eye										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	3	5.6	9	16.7	5	9.3	13	24.1	24	44.4
M	3	6	9	18	9	18	11	22	18	36
p=0.73 (P<0.05)										
Midline Crossing of Left Eye										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	3	5.6	6	11.1	12	22.2	13	24.1	20	37
M	2	4	9	18	10	20	10	20	19	38
0.87 (P<0.05)										
Convergence										
Total Females (F)						53				
Total Males (M)						50				
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	1	1.9	13	24.5	6	11.3	12	22.6	21	39.6
M	2	4	7	14	11	22	16	32	14	28
Probability						0.24 (P<0.05)				

Quick Localisation										
	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
Gender	n	%	n	%	n	%	n	%	n	%
F	1	1.9	2	3.7	3	5.6	18	33.3	30	55.6
M	0	0	1	2	14	28	20	40	15	30
p=*0.00 (P<0.05)										

A statistically significant difference could be drawn between the performance of boys and girls in the visual pursuit's and quick localisation components of this subtest, with girls being more likely to obtain a grade score of 5.

No other statistically significant differences in performance could be drawn for the remainder of the portions of this subtest.

Table 4.30 will now present gender differences between participants found for the measurable characteristics. Only statistically significant differences could be found for visual pursuits and convergence eye movements.

Table 4. 30 Gender differences for Visual Pursuits and Convergence subtests

SH Parameters	Visual Pursuits	Convergence
p values		
Visual fixation on object	*0.03	0.68
Smooth coordinated eye movements	0.08	*0.04
Eyes move independently from head	*0.00	0.11
SNH Parameters	Visual Pursuits	Convergence
p values		
Difficulty fixating on object	*0.03	0.53
Rigid movement	0.08	*0.04
Makes use of head movements	*0.00	0.05

4.3.9. Tongue Movements (TM) & Lip Movements (LM)

4.3.9.1. Measurable Characteristics for TM & LM

Table 4.31 depicts the grade scoring of participants when performing the tongue movements (TM) subtest.

Table 4. 31 Measurable results of the TM subtest

Up and Down (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
10	9.62	29	27.88	15	14.42	7	6.73	43	41.35

Side to Side (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
0	0	2	1.92	8	7.69	14	13.46	80	76.92
Circular (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
7	6.73	23	22.12	18	17.31	16	15.38	40	38.46
Tongue Wagging (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
0	0	17	16.35	35	33.65	35	33.65	17	16.35

In the side to side tongue movements 41.35% (n=43) of participants obtained a grade score of 5, whereas in the up down tongue movements 76.92% (n=80) of participants obtained a grade score of 5. In the circular tongue movements subtest 38.46% (n=40) of participants obtained a grade score of 5. In the tongue wagging subtest 33.65% (n=35) of participants obtained a grade score of 3 and 4.

Table 4.32 depicts the grade scoring and number of seconds participants were able to hold the kissing face and blowing up cheeks face when performing the Lip Movements (LM) subtest.

Table 4. 32 Measurable results of the LM subtest

Kissing face (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
10	9.6	2	1.9	13	12.5	4	3.9	75	72.1
Blowing up cheeks (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
0	0	3	2.9	7	6.7	18	17.3	76	73.1
Time in seconds *To maintain lip movements		Kissing Face				Blow up Cheeks			
		n		%		n		%	
	0	10		9.62		0		0	
	1	0		0		0		0	
	2	0		0		0		0	
	3	0		0		2		1.92	
	4	2		1.92		1		0.96	
	5	3		2.88		1		0.96	
	6	1		0.96		2		1.92	
	7	4		3.85		3		2.88	
	8	5		4.81		1		0.96	
	9	1		0.96		0		0	
	10	78		75		94		90.38	

Interquartile Range for Maintenance of Lip Movements in seconds			
	Minimum	Median	Maximum
Kissing Face	0	10	10
Blow up Cheeks	3	10	10

A grade score of 5 was obtained by 72.1% (n=75) participants in the kissing face portion and 73.1% (n=76) participants in the blowing up cheeks portion of this subtest.

For both the kissing face and the blow, up cheek face participants could hold these faces for a median of 10 seconds.

4.3.9.2. Observable Characteristics for TM & LM

Observable characteristics refer to the performance of participants in all the individual sections of the tongue movements (TMs) subtest. Table 4.33 depicts these observable characteristics of participants when performing the TM subtest.

Table 4. 33 Observable results of the TM subtest

SH Parameter	Up and down		Side to side		Circular		Tongue Wagging			
	N	%	n	%	n	%	N	%		
Accurately Completes Movement	62	59.6	102	98.1	73	70.2	87	83.7		
SNH Parameter	Up and down		Side to side		Circular		Tongue Wagging			
	n	%	n	%	n	%	N	%		
Cannot Complete Movement	38	36.5	14	13.5	2	1.9	31	29.8	17	16.4
Associated movement of head	13	12.5	12	11.5	9	8.7	17	16.4		
Associated movement of jaw	2	1.9	3	2.9	17	16.4	29	27.9		
Tongue jerks in corner of mouth			6	5.8	15	14.4	30	28.9		
Reduced speed of motion (BIS)	8	7.7	5	4.8	8	7.7	34	32.7		
Jerky Movement (BIS)	12	11.5	13	12.5	44	42.3	66	63.5		
General SNH Parameters										
					n		%			
Slouches in seat (PC)					32		30.8			
Involuntary tongue protrusion (LT)					3		2.9			
Dribbling (LT)					48		46.2			
Difficulty sustaining tongue protrusion (LT)					34		32.7			
Purses Lips					57		54.8			

Should Have Parameters

The only SH parameter in the tongue movements portion was the ability to accurately complete the movement(s). This observation could be observed in 59.6% (n=62) participants in the up and down component, 98.1% (n=102) participants in the side to side component, 70.2% (n=73) participants in the circular component and 83.7% (n=87) participants in the tongue wagging component.

Should Not Have Parameters

Inability to complete the movement was observed in 36.5% (n=36) of participants in the up part of the up down component and 13.5% (n=14) of participants in the down part. Inability to complete the movement was observed in 1.92 (n=2) participants in the side to side component, 29.8% (n=31) participants in the circular component and 16.4% (n=17) participants in the tongue wagging component. The tongue jerking in the corner of the mouth was observed in 28.9% (n=30) of participants in the tongue wagging component.

Reduced speed of motion in 32.7% (n=34) of participants in the tongue wagging component. Finally, jerky movement could be observed in 42.3% (n=44) of participants in the circular component and 63.5% (n=66) of participants in the tongue wagging component.

General SNH Parameters

For the Tongue Movements portion, the following general observations were noted. Slouching in seat could be observed in 30.8% (n=32) participants, dribbling was observed in 46.2% (n=48) participants, difficulty sustaining tongue protrusion could be observed in 32.7% (n=34) participants and pursing of lips was observed in 54.8% (n=57) of participants.

Table 4.34 depicts the observable characteristics of participants, present, when performing Lip Movement (LM).

Table 4. 34 Observable results of the LM subtest

SH Parameter	Kissing Face		Blow up Cheeks	
	n	%	n	%
Able to assume facial expression	95	91.4	102	98.1
Able to maintain facial expression for 10 seconds	79	76	95	91.4
SNH Parameter	Up and down		Side to side	
	n	%	n	%
Unable to assume facial expression	9	8.7	2	1.9
Unable to maintain facial expression for at least 10 seconds	25	24	9	8.7
Drooling/ Dribbling	0	0	0	0
Unable to push lips forward	25	24		
Air escapes from lips			27	26

Should have Parameters

The ability to assume the facial expression in the kissing face component could be observed in 91.4% (n=95) participants and 98.1% (n=102) in the blow-up cheek's component. The ability to maintain the facial expression for more than 10 seconds could be observed in 76% (n=79) participants in the kissing face component and 91.4% (n=95) participants in the blow-up cheek's component.

Should Not Have Parameters

In the kissing face component, the inability to push their lips forward was observed in 24% (n=25) participants. In the blow-up cheek's component, air escaping was observed in 26% (n=27) participants.

4.3.9.3. Gender differences in performance for TM & LM

Table 4.35 demonstrated the gender differences between participants all the components of the tongue movements subtest.

Table 4. 35 Gender differences between participants in the TM subtest

Tongue Movements										
Total Females (F)						54				
Total Males (M)						50				
Up and Down Movement										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	N	%	n	%	n	%	n	%
F	4	7.4	17	31.4	9	11.1	3	5.6	24	44.4
M	6	12	12	24	9	18	4	8	19	38
p=0.66 (P>0.05)										
Side to Side Movement										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	N	%	n	%	n	%	n	%
F	0	0	1	1.9	3	5.6	8	14.9	4	77.8
M	0	0	1	2	5	10	6	12	38	76
p=0.84 (P>0.05)										

Circular Movement										
	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
Gender	n	%	N	%	n	%	n	%	n	%
F	2	3.7	9	16.7	12	22.2	8	14.8	23	42.6
M	5	10	14	28	6	12	8	16	17	34
p=0.27 (P>0.05)										
Tongue Wagging										
	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
Gender	n	%	n	%	n	%	n	%	n	%
F	0	0	5	9.3	16	29.6	22	40.7	11	20.4
M	0	0	12	24	19	38	13	26	6	12
p=0.08 (P>0.05)										

No statically significant differences between boys and girls could be found in any section of this subtest.

Table 4.36 depicts gender differences in the performance of components of the lip movements subtest.

Table 4. 36 Gender differences between participants in the LM subtest

Lip Movements										
Total Females						54				
Total Males						50				
Kissing Face										
	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
Gender	n	%	n	%	n	%	n	%	n	%
F	3	5.6	0	0	6	11.1	3	5.6	42	77.8
M	7	14	2	4	7	14	1	2	33	66
p=0.25 (P>0.05)										
Blow-Up cheeks face										
	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
Gender	n	%	n	%	n	%	n	%	n	%
F	0	0	0	0	2	3.7	6	11.1	46	85.2
M	0	0	3	6	5	10	12	24	30	60
p=*0.02 (P<0.05)										

No statistically significant gender differences in the performance of the kissing face component could be drawn. A statistically significant difference could however be drawn between boys and girls in the blow-up cheeks face, with girls being slightly more likely to obtain a grade score of 5.

4.3.10. Jumping Sequences (J)

4.3.10.1. Measurable Characteristics

Table 4.37 depicts the grade score of participants, in each section of the jumping subtest.

Table 4. 37 Measurable Results of the J subtest

Jumping Sequence n=104									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
0	0	6	5.8	33	31.7	40	38.5	25	24
Jump hop sequence n=104									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
34	32.7	27	26	23	22.1	18	17.3	2	1.9
Open Close Legs n=104									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
n	%	n	%	n	%	n	%	n	%
2	1.9	18	17.3	27	26	36	34.6	21	20.2

In the jumping sequencing component of this subtest 38.5% (n=40) participants obtained a grade of 4. In the jump hop component 32.7% (n=34) participants obtained a grade 1. In the jumping with legs open and closed component 34.6% (n=36) participants obtained a grade of 4.

4.3.10.2. Observable Characteristics

Table 4.38 depicts the results for the observable characteristics for participants in the jumping subtest.

Table 4. 38 Observable results of the J subtest

SH Parameters	Jumping sequence		Jump hop sequence		Open and close legs	
	n	%	n	%	n	%
Jumps with feet together	101	97.1	56	53.9	89	85.6
Follows sequence	99	95.2	41	39.4	84	80.8
Continuous movement in sequence	68	65.4	50	48.1	76	73.1
Controlled stop	71	68.3	33	31.7	62	59.6
SNH Parameters	Jumping sequence		Jump hop sequence		Open and close legs	
	n	%	n	%	n	%
Unable to maintain feet together in jump (5cm allowance)	3	2.9	49	47.1	15	14.4
Unable to accurately execute sequence	7	6.7	64	61.5	20	19.2
Maintains legs stiff/ in extension	50	48.1	25	24	39	37.5
Starts and stops the sequence	32	30.8	56	53.9	26	25
Poor RhytTP	41	39.4	70	67.3	46	44.2
Cannot control stop	35	33.7	69	66.4	43	41.4
Abducts arms more than 15°	22	21.2	49	47.1	43	41.4
Flexes elbows	44	42.3	58	55.8	55	52.9
General SNH Parameters	Jumping Sequence		Jump hop sequence		Open and close legs	
	n	%	n	%	n	%
Poorly graded landing (Prop)	32	30.8	28	26.9	29	27.9
Finishing beyond or behind the 4m marker (Prop)	9	8.7	1	1	0	0
Asks or requires the examiner to repeat demonstration of sequence (I)	5	4.8	10	9.6	3	2.9

Associative reactions of mouth (SNe)	32	30.8	42	40.4	37	35.9
Fixates arms	58	55.8	36	34.6	44	42.3
Criss Crosses legs					12	11.5

Should Have Parameters

Jumping with feet together could be observed in 97.1% (n=101) participants in the jumping sequence, 53.9% (n=56) participants in the jump hop sequence and 85.6% (n=89) participants in the jumping with legs open and closed sequence. The ability to accurately complete the sequence was observed in 95.2% (n=99) participants in the jumping sequence, 39.4% (n=41) participants in the jump hop sequence and 80.8% (n=84) participants in the jumping with legs open and closed sequence. Continuous movement throughout the sequence could be observed in 65.4% (n=68) participants in the jumping sequence, 48.1% (n=50) participants in the jump hops sequence and 73.1% (n=76) participants in the jumping with legs open and closed portion of the subtest. Controlled stopwatch observed in 68.3% (n=71) participants in the jumping sequence, 31.7% (n=33) participants in the jump hop sequence and 59.6% (n=62) participants in the jumping with legs open and closed subtest.

Should Not Have Parameters

The inability to maintain feet together (with a 5cm allowance) was observed 47.1% (n=49) participants in the jump hop sequence. The inability to accurately complete the sequence was observed in 61.5% (n=64) of participants in the jump hop sequence. Maintaining legs stiff or in extension could be observed in 48.1% (n=50) participants in the jumping sequence, 24% (n=25) participants in the jump hop sequence and 37.5% (n=39) participants in the jumping with legs open and closed sequence. Starting and stopping the sequence could be observed in 30.8% (n=32) participants in the jumping sequence, 53.9% (n=56) participants in the jump hop sequence and 25% (n=25) participants in the jumping with legs open and closed sequence. Poor rhythm could be observed in 39.4% (n=41) participants in the jumping sequence, 67.3% (n=70) participants in the jump hop sequence and 44.2% (n=46) participants in the jumping with legs open and closed sequence. Inability to control the stop of each sequence could be observed in 33.7% (n=35) participants in the jumping

sequence, 66.4% (n=69) participants in the jump hop sequence and 41.4% (n=43) participants in the jumping with legs open and closed sequence. Abducting arms more than 15° during each sequence was observed in 22.2% (n=22) participants in the jumping sequence, 47.1% (n=49) participants in the jump hop sequence and 41.4% (n=43) participants in the jumping with legs open and closed sequence. Flexing of elbows during the course of the sequences was observed in 42.3% (n=44) participants in the jumping sequence, 55.8% (n=58) participants in the jump hop sequence and 52.3% (n=55) participants in the jumping with legs open and closed sequence.

General SNH Parameters

Poorly graded landing could be observed in 30.8% (n=32) of participants in the jumping sequence, 26.9% (n=28) of participants in the jump hop sequence and 27.9% (n=29) of participants in the jumping with legs open and closed sequence. An associative reaction of the mouth could be observed in 30.8% (n=32) participants in the jumping sequence, 40.4% (n=42) participants in the jump hop sequence and 35.9% (n=37) of participants in the jumping with legs open and closed sequence. Fixating arms could be observed in 55.8% (n=58) of participants in the jumping sequence, 34.6% (n=36) participants in the jump hop sequence and 42.3% (n=44) participants in the jumping with legs open and closed.

4.3.10.3. Gender differences in performance for J

Table 4.39 depicts gender differences between participant for grade scoring, in each component of the Jumping subtest.

Table 4. 39 Gender differences between participants for grade scoring in the J subtest

Jumping Sequences										
Total Females (F)						54				
Total Males (M)						50				
Jumping										
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	N	%	n	%	n	%	n	%
F	0	0	0	0	12	22.2	23	42.6	19	35.2
M	0	0	6	12	21	42	17	34	6	12
p=*.000 (P<0.05)										

Jump Hop										
	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
Gender	n	%	N	%	n	%	n	%	n	%
F	11	20.4	15	27.8	11	20.4	15	27.8	2	3.7
M	23	46	12	24	12	24	3	6	0	0
p=*0.01 (P<0.05)										
Legs open and closed										
	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
Gender	n	%	N	%	n	%	n	%	n	%
F	1	1.9	6	11.1	13	24.1	17	31.5	17	31.5
M	1	2	12	24	14	28	19	38	4	8
p=*0.04 (P<0.05)										

A statistically significant difference could be drawn between boys and girls in the performance of the jumping, jump hop and legs open and closed sequences, with girls performing marginally better than boys.

Table 4.40 will now present gender differences between participants found for the measurable characteristics.

Table 4. 40 Gender differences for observable characteristics in the J subtest

SH Parameters	Jumping sequence	Jump hop sequence	Open and close legs
p values			
Jumps with feet together	0.60	*0.01	0.50
Continuous movement in sequence	0.12	0.99	0.81
Controlled stop	*0.01	*0.01	0.26
SNH Parameters	Jumping sequence	Jump hop sequence	Open and close legs
p values			
Unable to accurately execute sequence	*0.02	*0.03	0.23
Maintains legs stiff/ in extension	0.05	0.65	*0.03
Starts and stops the sequence	*0.02	0.72	0.26
Poor Rhythm	*0.03	0.57	0.12
Abducts arms more than 15°	0.49	0.57	0.9
Flexes elbows	0.26	0.22	0.54
General SNH Parameters	Jumping Sequence	Jump hop sequence	Open and close legs
p values			
Poorly graded landing	0.12	*0.04	0.18
Finishing beyond or behind the 4m marker	0.08	0.33	0.12
Asks or requires the examiner to repeat demonstration of sequence	1.0	0.32	0.24
Associative reactions of mouth	*0.04	*0.02	*0.03
Fixates arms	0.4	0.49	0.74
Criss Crosses legs			0.64

A statistically significant difference could be drawn between boys and girls in some observations. Girls were more likely to jump with their feet together in the jump hop sequence. For the jumping and jump hop sequences girls were

more likely to present with a controlled stop and accurately complete these sequences. Boys were more likely to maintain their legs stiff in the open and closed sequence. Starting and stopping and poor rhythm were more noticeable for boys in the jumping sequence.

A poorly graded landing was more frequently observed in boys for the jump hop sequence. An associative reaction of mouth was more frequently observed in boys in all the sequences.

4.3.11. Ideation Challenge (IC)

4.3.11.1. Measurable Characteristics for the IC

The measurable characteristics for this subtest include the grade scoring of participants, the duration in seconds that participants were able to engage in the Ideation Challenge subtest and the number of Ables participants were able to ideate. Table 4.41 depicts the measurable results of participants in the ideation challenge.

Table 4. 41 Measurable results of the IC subtest

Ideation Challenge (n=104)									
Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
N	%	N	%	n	%	n	%	n	%
1	1	73	70.2	20	19.2	9	8.7	1	1
Time in seconds			N			%			
0-50	Seconds	1			1				
51-100	Seconds	14			13.4				
101-150	Seconds	30			28.8				
151-200	Seconds	21			20.6				
201-250	Seconds	18			17.3				
251-300	Seconds	20			19.2				
Number of Ables									
			N			%			
1			6			5.8			
2			19			18.3			
3			18			17.3			
4			9			8.7			
5			15			14.4			
6			10			9.6			
7			7			6.7			
8			10			9.6			
9			4			3.9			
10			3			2.9			
11			2			1.9			

In the IC subtest 70.2% (n=73) of participants obtained a grade score of 2. In terms of ability to sustain attention in this subtest 28.8% (n=30) participants were able to do so for between 101-150 seconds (1.7-2.5 minutes). When looking at the number of Ables that participants were able to identify, 18.3% (n=19) participants, were able to identify two Ables.

4.3.11.2. Observable Characteristics for the IC

Table 4.42 depicts the observable characteristics for the IC subtest. They consist of Should Have and Should Not Have Parameters only.

Table 4. 42 Observable results of the IC subtest

SH Parameters	Ideation Challenge	
	n	%
Wash Able	31	29.8
Clean Able	10	9.6
Put on floor Able	15	14.4
Stand on Able	2	1.9
Pendulum Swing Able	17	16.4
Wring/ Twist Able	20	19.2
Pass around body Able	0	0
Fan Able	12	11.5
Spin in circle Able	19	18.3
Bite Able	4	3.9
Scrunch Able	34	32.7
Throw Able	25	24
Twirl Able	18	17.3
Wrap around Able	30	28.9
Whip Able	18	17.3
Stretch out between two hands Able	56	53.9
Hold against body Able	27	26
Jump over or on Able	1	1
Fold Able	61	58.7
Other Ables	49	47.1
SNH Parameters	Ideation Challenge	
	n	%
Explosive emotions (E)	34	32.7
Shy to interact with washcloth (E)	29	27.9
Inattentive behaviour (IA)	6	5.8
Uses language to describe the activity instead of demonstrating actions	59	56.7
Tries to incorporate other objects in the activity	11	10.6

Should Have Parameters

Should have parameters for this subtest were scored specifically according the Ables that the child was able to identify. For the washing body Able, 29.8% (n=31) participants were able to ideate this Able. The scrunch Able was

observed in 32.7% (n=34) participants, 24% (n=25) presented with the throw Able. The wrap around body Able, could be observed in 28.9% (n=30) participants and 53.9% (n=56) participants presented with the stretch between two hands Able. The hold against body Able was observed in 26% (n=27) participants, 58.7% (n=61) participants performed the fold Able. 47.1% (n=49) of participants presented with other Ables not initially listed in the measurement instrument.

Should Not Have Parameters

An explosive emotional response was observed in 32.7% (n=34) participants and 27.9% (n=29) participants were shy to interact with the wash cloth. The tendency to use language to describe the activity instead of demonstrating the action could be observed in 56.7% (n=59) participants.

4.3.11.3. Gender differences in performance for the IC

Table 4.43 depicts gender differences between participants in the grade scoring of the IC subtest.

Table 4. 43 Gender differences between participants in the IC subtest

Ideation Challenge										
Total Females (F)						54				
Total Males (M)						50				
Gender	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	n	%	n	%	n	%	n	%	n	%
F	1	1.9	39	72.2	9	16.7	5	9.3	0	0
M	0	0	34	68	11	22	4	8	1	2
p=0.81 (P>0.05)										

No statistically significant gender differences could be drawn in performance of the IC subtest.

4.4. SUMMARY

In this section the study results were simply stated and tabulated for each subtest of the RCOs. Results were reported in the sequence of the study objectives. The researcher presented results according to frequencies, percentages, means procedures and probability, which were calibrated by the biostatistician. A gross sample of 104, five-year-old children were studied, of which 54 were girls and 50 were boys. A smaller sample size was studied, for the performance of children in the RIP, SM and ET (eye convergence) subtests.

In the upcoming section study results will be described to give them sense and meaning. Results will also be compared to applicable literature so that the hypothesis that the researcher draws is supported by relevant sources.

CHAPTER 5

DISCUSSION OF STUDY RESULTS

In Chapter 4 the results were tabulated and written out in full. The sociodemographic distribution of the sample was briefly discussed and followed by the presentation of the results for each subtest of the Revised Clinical Observations (RCOs). The discussion of results, for each subtest, are presented in the order depicted in figure 5.1.

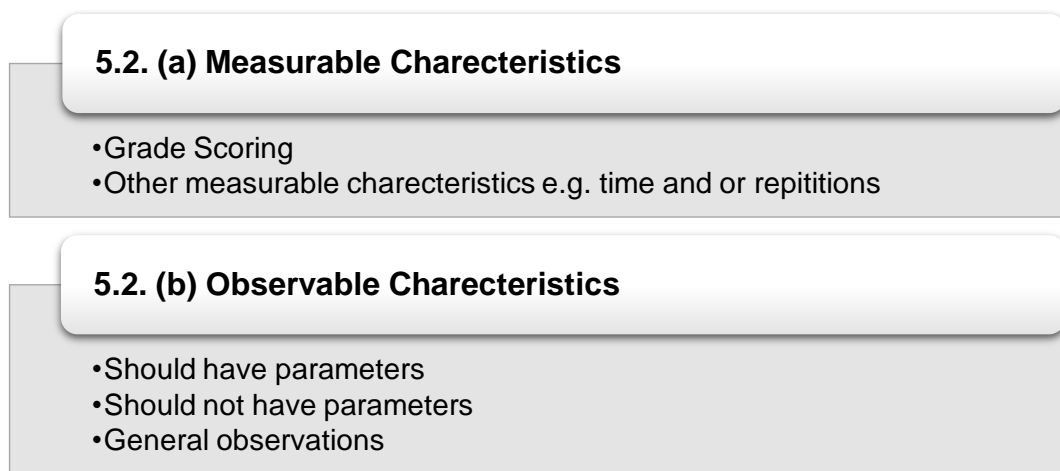


Figure 5. 1 The sequence in which results are discussed

The results are presented in the order as the research objectives, which is followed in Chapter 4. At the end of this chapter the researcher will review gender differences in the performance of the 11 subtests of the RCOs.

In this Chapter, the results will be discussed to give meaning to the study. The researcher aims to make use of relevant literature to substantiate her results. Finally, the researcher hopes to describe results in such a way that they can be practically applied to practice, specifically when interpreting the performance of five-year-old children in the RCOs.

Before describing the results children obtained in each subtest of the RCOs, the researcher will summarise the sociodemographic portfolio of the study sample.

5.1. DEMOGRAPHIC INFORMATION OF PARTICIPANTS

Of the 104 participants, there were marginally more girls than boys. This is consistent with the population distribution of the Buffalo City Metro and the Eastern Cape as a whole (Eastern Cape Socioeconomic Consultative Council, 2017, pp.10-15).

Majority of participants (86%) came from quintile 1-3 Schools (no-fee schools), which is consistent with the population, with 85.7% of schools in the Buffalo City Metro being classified as quintile 1-3 schools (Janse Van Rensburg, 2018).

Participants were English, Afrikaans and isiXhosa speaking. These are the top three most spoken languages in the Buffalo City Metro, with other languages only spoken by 1.1% of people in the area (Eastern Cape Socioeconomic Consultative Council, 2017, p.10).

Majority of participants presented with right hand preference (92.31%), this is consistent with international and national studies which indicate that approximately 90% of people are right-handed (Scharoun & Brydan, 2014, p.1; Coren & Porac, 1977; de Milander, Kingwill, Wolmarans & Venter, 2014, p.1). Of the total sample, a larger number of girls presented with a right-hand preference than boys. This implies that left hand preference was favoured by boys, which is consistent with literature (Peters, Reimers & Manning, 2006, p.177; Singh, Manjary & Dellatolas, 2001, p.231; Gilbert & Wysocki, 1992, p.601; Papadatou-Pastou, Martin, Munafo & Jones, 2008, p.677).

There was a relatively even distribution of right and left eye preference in boys and girls. Collectively, participants were however more likely to present with a left eye preference. This is inconsistent with literature (de Milander, Kingwill, Wolmarans & Venter, 2014, p.1). The researcher is aware that eye preference develops slower than hand and foot preference and that it is not established at five-years, the researcher proposes that this possibly impacts the poor correlation to eye dominance studies (O'Brien & Williams, 2010, p.262). More

research needs to be conducted to determine eye preference in the five-year-old child.

Many children who preferred their left hand, did not prefer their left eye. This suggests that some participants present with mixed preference for example prefer their left hand and right eye. Mixed preference is a well-studied phenomenon. A study by de Milander, Kingwill, Wolmarans & Venter (2014) found that children with pure profiles were more likely to obtain school readiness than children with mixed profiles. The researcher proposes that more research needs to be done to establish the frequency of mixed profiles in South African (San) children and the potential relationship between preference profiles and school performance.

5.2. DISCUSSION OF RESULTS, OF THE REVISED CLINICAL OBSERVATIONS

The results for each subtest will be discussed in terms of measurable and observable characteristics. Finally, gender differences according to performance will be discussed in terms of probability. The researcher will now explain how she interpreted the results, starting with an explanation of the interpretation of the measurable characteristics.

Explanation of the interpretation of the measurable Characteristics

The measurable characteristics are further refined by clustering grade scoring of participants into two subgroups. Participants who obtained a grade scoring of between 1 and 3 were clustered into the lower grade scoring category. Participants who obtained a grade scoring of between 4 and 5 were clustered into the higher-grade scoring category. The categorisation of grade scoring is depicted in Table 5.1.

Table 5. 1 Classification of Grade Scoring according to function

Grades indicative of dysfunction			Grades indicative of adequate function	
1	2	3	4	5
Unable to perform	Makes an attempt but only achieves partially	Able to perform, poor control/not well integrated	Good, slight inconsistencies/lacks some integration	Execute with ease / good control / well integrated /

The researcher then analysed numerical data such as repetition, degrees and times in seconds by looking at their interquartile range.

The performance of children in each of the subtests of the RCOs, is then discussed and compared to relevant literature.

The researcher will now explain her interpretation of the observable characteristics.

Explanation of the interpretation of the Observable Characteristics

The researcher determined to which degree participants were likely to present with an observation, by clustering the prevalence that an observation was present within the study sample into three groups. These groups were often present, occasionally present and rarely present. The same clustering of prevalence was used in a descriptive study by Potgieter (2018) and the researcher chose to adopt this to enable swift comparison of the ATNR, RIP and STNR subtests.

Table 5.2 depicts the 1-3 clustering by the researcher which follows an ascending order.

Table 5. 2 The likelihood of participants to present with an Observable Characteristic

	1	2	3
Likelihood of the presence of an observation	Rarely Present	Occasionally Present	Often Present
% of Participants	0.00%-24.99%	25.00%-74.99%	75.00%-100.00%

An explanation of the interpretation of gender differences in this study

Statistically significant differences in performance of participants in accordance to gender, are indicated by p values less than 0.05. Gender differences in the performance of subtests is collectively discussed at the end of the chapter.

5.2.1. Asymmetrical Tonic Neck Reflex (ATNR) and Reflex Inhibiting Posture (RIP)

5.2.1.1 Measurable Characteristics

ATNR

Majority of participants obtained a grade score of between 1 and 3, which is congruent with Potgieter (2018, 115). These grade scores indicate that participants presented with elbow flexion more than 25°. Dunn (1981) suggests that this is indicative of a positive ATNR.

There are contrasting results on how many degrees of elbow flexion are atypical. Parmenter (1975) proposed that 30° is typical in the pre-school child, Zemke (1984, p.178) suggested that 32° elbow flexion is typical for the five-year-old child and Parr, Routh, Byrd and McMillen (1974, pp.329-335) recommended that as much as 49° elbow flexion may be typical. The researcher proposes that the presence of elbow flexion is not necessarily an indicator of dysfunction, but that the magnitude to which it is present is a better indicator.

A recent study by Potgieter (2018, p.180), implies that it is extremely likely that the five-year-old child will present with a positive ATNR, which is supported by Gieysztor, Choinska & Paprocka-Borowicz, (2018, p.167). Studies by Clark (2012) and Van Jaarsveld (2010) also indicated a prevalent presence of primitive reflexes of children between three and five years. Clark (2012) hypothesised that this may be due to poor stimulation.

In this study participants presented with an interquartile range of between 25° to 85° elbow flexion. The lower quartile is far less than that identified by Potgieter (2018, p.181). The upper quartile was however almost identical to Potgieter who found that children presented with 83° of elbow flexion. The range of elbow flexion, found in both studies are far more than that suggested in the initial format of the COs by SAISI (2005) for the pre-school child, which is between 30°-60° SAISI (2005). It is alarming that elbow flexion of as much as 85° was recorded on what is assumed to be a typical population.

There is a confounding body of knowledge which indicates that the persistence of primitive reflexes beyond the first year of life can be indicative of neurodevelopmental delay (NDD) (McPhillips, Hepper & Mulher 2000, p. 537; McPhillips & Jordan-Black, 2007; Chinello, Di Gangi, Valenza, 2016; Blythe & McGlown, 1979). A correlation has been found between the presence of primitive reflexes and learning and motor disorders such as dyslexia, auditory processing difficulties, ADHD, ASD and motor incoordination to name a few (Chinello, Di Gangi & Valenza, 2011; Shumway-Cook & Woollacot, 2012, p.197). The researcher agrees with the proposition that the persistence of primitive reflexes can impact school performance of the child (Chinello, Di Gangi, Valenza, 2016, p.7; Melillo, 2011, p.27). The researcher fears that the high degree of elbow flexion of participants may indicate that children with NDD are being overlooked by screening procedures and do not receive the clinical services needed to succeed in a school-based setting (Goddard Blythe, 2012). In a resource constrained country such as South Africa this is not impossible. The researcher also suggests that the presence of primitive reflexes need to be included in school readiness screenings. Accurate identification and treatment of primitive reflexes could be an option for children who do not respond to normal remedial education (Goddard Blythe & Hyland, 1998).

RIP

Majority of participants obtained a grade score of between 1-3 (67.5%-74.7%; n=48-53) in this subtest, which implies that children presented with dysfunction and subsequently a positive ATNR. Both the ATNR and RIP subtests

correspond with one another and suggest that majority of participants presented with a positive ATNR.

The median number of seconds children were able to maintain the RIP, on their left and their right side only differed marginally. Children were able to maintain the RIP for a median of 5-6 seconds. This is almost completely identical to results obtained from Potgieter (2018, p.116), which found that the five-year-old child could maintain the left RIP for 7 seconds and the right RIP for 6 seconds. Children in this study held the RIP for an interquartile range of 0-33 seconds. A time of 0 seconds indicates that children were unable to assume nor hold the position, this totals to 8.5% of participants. This finding is similar to Dunn (1981, p.30) who found that 6% of five-year-old children were unable to hold the RIP. Potgieter (2018, p.185) also indicated that between 6.7%-7.5% of five-year-old children were unable to assume the RIP.

In the study by Potgieter (2018, p.310), participants were required to hold the RIP for 4-5 seconds to obtain a grade score of between 4-5. Grade scoring would have been similar to Potgieter (2018) if the researcher had followed the same scoring procedure. The researcher used her pilot study to design the criteria for this subtest. Upon reflection the researcher acknowledged that maintaining this position for 10-20 seconds, which afforded a score of 4-5 was possibly beyond the capacity of the five-year-old child. The researcher recommends that this subtest be re-investigated on the five-year-old child.

5.2.1.2. Observable Characteristics

ATNR

Table 5.3. Depicts the likelihood that a participant will present with a given SH or SNH parameter in the ATNR subtest. This is clustered from 1-3.

Table 5. 3 The frequency with which observable characteristics were present for the ATNR

1		2	3
Rarely Present		Occasionally Present	Often Present
0.00%-24.99%		25.00%-74.99%	75.00%-100.00%
SH Parameters	<ul style="list-style-type: none"> • Elbow Flexion less than 25° • No Changes in Joint Position 	N/A	<ul style="list-style-type: none"> • Maintenance of head position
SNH Parameters	<ul style="list-style-type: none"> • Extension of leg on face side • Moving hips over to side • Loses balance • Body Swaying • Resistance to head turning 	<ul style="list-style-type: none"> • Locking or fixating elbows 	<ul style="list-style-type: none"> • Elbow Flexion more than 25°

Often Present

The tendency to *maintain head position* was frequently observed. *Elbow flexion more than 25°* was another frequent observation. This is congruent with recent studies (Potgieter, 2018, p.118; Gieysztor, Choinska & Paprocka-Borowicz 2018). The study did not yield a conclusive range of elbow flexion that is considered “typical” from results obtained for both the right and the left ATNR, when comparing the researcher’s findings to relevant literature. This may support Potgieter’s (2018, p. 182) hypothesis, which suggests that the ATNR subtest is not a sensitive subtest, and that the test is subject to human error. DeGangi-Berk (1983), elaborated in her manual for the Test for Sensory Integration (TSI), that the assessment for primitive reflexes was one of the only subtests in which inter-observer reliability could not be established. Dunn (1981), suggested that the presence of the ATNR should rather be assessed by the child’s ability to perform the RIP. The researcher concludes that the assessment of the ATNR is subject to human error and agrees strongly with Potgieter (2018), who suggests that this subtest should be completed in conjunction with the RIP and the Schilder’s arm extension test to accurately conclude whether or not a child presents with a positive ATNR.

Occasionally Present

Children occasionally *locked or fixated their elbows* (45.2%-48.1%, n=47-50) when performing this subtest. Children were marginally more likely to struggle to *maintain their head position* in the left ATNR than the right ATNR. This observation was also frequently observed by Potgieter (2018, p.184), when stimulating both a left and right ATNR.

Rarely Present

Participants were unlikely to present with extension of their leg on the side their head was turned (1-1.9%; n=1-2), *moving their hips to the side* (1.9%, n=2), *losing their balance* (1.9%, n=2) and *body swaying* (12.5%-15.4%; n=13-16). SAISI (2005), suggests that only severe dysfunction, causes the child to collapse or lose their balance when an ATNR is facilitated. Participants were also unlikely to present with resistance to head turning (16.4%-20.2%; n=17-21). Ayres (1973, p.102) suggested that the presence of this observation may be the child's attempt to avoid the disorganising response of an elicited ATNR. This observation was found to be sometimes present by Potgieter (2018), but she later concluded that it that it decreased significantly in the RIP. The presence of this observation alone can thereby not be the only indicator of a positive ATNR as proposed by Potgieter (2018, p.184).

RIP

Table 5.4 depicts the likelihood that participants presented with a given SH and SNH parameter for the RIP subtest. There were no significant left right differences in the performance of the RIP and for the observable characteristics the RIP as a whole will be discussed.

Table 5. 4 The frequency with which observable characteristics were present for the RIP

1	2	3
Rarely Present	Occasionally Present	Often Present
0.00%-24.99%	25.00%-74.99%	75.00%-100.00%

SH Parameters	N/A	<ul style="list-style-type: none"> • Maintains head position • Leg in line with hip 	N/A
SNH Parameters	<ul style="list-style-type: none"> • Resistance to head turning 	<ul style="list-style-type: none"> • Unable to maintain arm position • Retracts chin into shoulders • Opens shoulders and turns body • Curves back • Loses balance • Locks elbows 	<ul style="list-style-type: none"> • Body swaying • Unable to maintain leg extended

Often Present

Participants often presented with *body swaying* in both the left and right RIP (95.8-97.2%; n=68-69), which indicates that they had difficulty holding the position. This finding is consistent with Potgieter (2018, p.186), who found that this observation was present in 94.1%-95.8% of participants. The SAISI (2005) Clinical Observations (COs) manual suggests that balance problems can be isolated when assuming the RIP by first raising the arm and leg before moving the child's head. The researcher found however that balance problems existed when holding the position not when assuming the position, which was also found by Potgieter (2018, p.186). The researcher proposes that the presence of this observation may be typical for this age group, but agrees with Potgieter (2018, P.186), when analysing the results of the ATNR subtest that it can be indicative of an unintegrated ATNR.

Children presented with difficulty *maintaining their leg straight* (80.3%-91.6%; n=65-57). The response of flexing the knee supports the notion that majority of participants presented with a positive ATNR. Maintaining a straight leg was observed by majority of participants in the RIP, in Potgieter's (2018) study. Due to contrasting results it is unclear whether or not a five-year-old child should or should not be able to maintain their leg straight in this item or not.

Occasionally Present

Participants occasionally *maintained their head position* (36.6%-49.3%; n=26-35). This observation is however far less likely to be present in the RIP subtest than the ATNR subtest. The added component of maintaining balance in the RIP subtest may make maintaining a head position more difficult. Participants occasionally *maintained their leg in line with their hip* (39.4-46.5%; n=28-33).

Participants occasionally maintained their back straight in both the left and the right RIP (32.4%-39.4%; n=23-28), this finding is slightly less than Potgieter (2018), but it must be considered that Potgieter (2018) had a larger study population for this subtest. The presence of a *curved back* in this study was far more likely (63.4%, n=45).

Majority of participants had difficulty *maintaining their balance* in this subtest (63.4%-66.2%; n=45-47). Other observations which indicate difficulties maintaining balance are *retracting the chin into the shoulder* (33.8%-39.4%; n=24-28) and *opening shoulders and turning the body* (47.9-52.1%; n=34-37), which were both occasionally observed. It is therefore a realistic expectation that a five-year-old child may present with balance difficulties in this subtest.

Rarely Present

Resistance to head turning was rarely observed in participants (23.9-25.4%; n=17-18). This finding is consistent with Potgieter (2018), who found that participants seldom resisted head turning (5.8%-7.5%; n=7-9) when performing the RIP.

5.2.2. Symmetrical Tonic Neck Reflex (STNR)

5.2.2.1. Measurable Characteristics

A high incidence of participants presented with a grade scoring of between 1-3 (90.4%, n=94), which indicates that they presented with a positive STNR. This finding is consistent with Potgieter (2018, p.189).

It is concerning that majority of participants in this study presented with both the ATNR and the STNR (primitive reflexes). DeGangi-Berk (1983), states that

when an ATNR and STNR is not integrated children are likely to present with poor midline crossing, trunk rotation and postural control. Furthermore, literature argues that persistence of the STNR and ATNR may cause children to have difficulty with ocular movements such as convergence problems and experiencing eye strain when reading (Goddard Blythe, 1996; Bilbilaj, Gjipali & Shkurti, 2017, p. 289; Hurst, Weyer, Smith, Adler, 2006, p.199; Andrich, Shihada, Vinci, Wrenhaven, Goodman, 2018, p.106).

The high prevalence of residual reflexes found in participants is concerning. In clinical practice there has been an increase in therapists who omit the assessment of reflexes as they doubt their clinical significance (Stallings-Sahler, Reinoso & Frauwirth, 2019, p. CE-6). The researcher proposes that therapists should take caution when omitting these subtests as it could impact their ability to identify attention and learning difficulties in the child (Goddard, 1996; Bilbilaj, Gjipali & Shkurti, 2017, p. 289; Hurst, van der Weyer, Smith, Adler, 2006, p.199; Andrich, Shihada, Vinci, Wrenhaven, Goodman, 2018, p.106; Chinello, Di Gangi & Valenza, 2011; Shumway-Cook & Woollacot, 2012, p.197).

5.2.2.2. Observable Characteristics

Table 5.5 depicts the likelihood of a child to present with a given SH and SNH parameter in the STNR subtest.

Table 5. 5 The frequency with which observable characteristics were present for the STNR

		1	2	3
		Rarely Present	Occasionally Present	Often Present
		0.00%-24.99%	25.00%-74.99%	75.00%-100.00%
SH Parameters	<ul style="list-style-type: none"> No changes in joint position 		N/A	N/A

SNH Parameters	<ul style="list-style-type: none"> • Inability to maintain head position • Cannot hold position when head in flexion • Cannot hold position when head in extension 	<ul style="list-style-type: none"> • Rounded back • Resist head turning • Locks elbows 	<ul style="list-style-type: none"> • Elbow flexion • Posterior pelvic tilt • Hyperextension of elbows • Lordosis • Anterior pelvic tilt
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Often Present

In head flexion majority of participants presented with *elbow flexion* (82.7%; n=86) and a *posterior pelvic tilt* (78.9%; n=82). In head extension majority of participants presented with *hyperextension of elbows* (79.8%; n=83), *lordosis* (84.5%; n=88) and an *anterior pelvic tilt* (84.5%; n=88). The results are consistent with Potgieter (2018, p. 191) who found that majority of five-year-old children presented with the above mentioned SNH parameters.

This indicates that significant postural changes, in a stimulated STNR are typical to this study sample. DeGangi, Berk and Larsen (1980, p.457) state that only in severe cases do children present with joint changes in flexion and extension. This was however not found by Potgieter (2018) and Gieysztor, Choinska & Paprocka-Borowics (2015, p.167). The high prevalence of a persistent STNR in this study is concerning. The researcher did not draw a link between the functional implication of an intact STNR and emphasises that future research needs to be explored.

Occasionally Present

Participants occasionally *resisted head movement* (26%-35.6%; 35-44) and *locked their elbows* (33.7%-42.3%; n=35-44), in both flexion and extension of the head. Both these observations were also only occasionally observed by Potgieter (2018, p.193). Resistance to head turning is described as the child's attempt to avoid the disorganising impact of the reflex (Ayres, 1973, p.102). Traditionally this observation is included in the ATNR subtest not the STNR subtest (SAISI, 2005; DeGangi, Berk & Larsen, 1980, p.457). The researcher agrees with Potgieter (2018, p.193), who hypothesises that the presence of this observation may be indicative of a severely delayed STNR.

In head flexion a *rounded back* was occasionally observed (48.1%; n=50). This is inconsistent with Potgieter (2018, p.191). Further investigation needs to be done to confirm the prevalence of this observation.

Rarely Present

In both head flexion and head extension, it was unlikely, that *no change in joint position* (2.9%-4.8%; n=3-5) would occur. This is congruent with Potgieter (2018, p.193), who found this observation was seldom present in the facilitation of the STNR. The minority of the study population thus did not have changes in their position of their hips, elbows and back. Dunn (1981) rarely found that children presented with a significant degree of elbow flexion (18.3%, n=22) when investigating pre-school children.

5.2.3. Bilateral Ball Hitting (BBH)

5.2.3.1. Measurable characteristics

Majority of participants presented with a higher-grade score of between 4 and 5 (78.8%-83.6%; n=82-87). To afford this score children were expected to hit the ball across their left and right midline and not shift their body more than 5°. Results are congruent with Stillwell (1987) and Carlier, Doyen and Lamard (2006, p.255), who suggested that children are likely to frequently cross the midline between four-nine years of age. It may therefore be atypical for a five-year-old child to obtain a lower grade scoring in this subtest and possibly a sign of vestibular-proprioceptive based disorders (Stallings-Sahler, Reinoso & Frauwirth, 2019, p. CE-5).

Studies show that manual midline crossing is complex and many factors may influence whether or not the child is able to perform manual midline crossing, such as the distance of an object in relation to the child (Atwood & Cermak, 1986; Hill & Khanem, 2009). The researcher suggests that this subtest needs to be used in conjunction with other formal testing, such as the SIPT, DeGangi Berk Assessment of Motor Proficiency, the Miller Assessment of Pre-schoolers (MAP) and potentially soon the Evaluation in Ayres Sensory Integration (EASI), to give a true reflection of the presence or lack thereof of manual midline crossing in the five-year-old child.

Children performed marginally better, when performing the bilateral ball hitting, when the ball was swung to their right side, rather than their left side. Some

studies indicate that there is an association between manual midline crossing and hand preference (Stilwell, 1987, p.131; Fagard, Spelke & von Hofsten, 2009; Logeswaran, 2016, p.11). The researcher suggests that majority of participants reached across their right midline rather than their left midline because they presented with a right-hand preference.

5.2.3.2. Observable Characteristics

Table 5.6 depicts the likelihood of a child to present with a given SH and SNH parameter in the BBH subtest.

Table 5.6 The frequency with which observable characteristics were present for the BBH

1		2	3
Rarely Present		Occasionally Present	Often Present
0.00%-24.99%		25.00%-74.99%	75.00%-100.00%
SH Parameters	N/A	N/A	<ul style="list-style-type: none"> • Makes use of midline crossing • Does not let go of foil roll • Elbow flexion and extension • Smooth arm movements • Able to follow instructions
SNH Parameters	<ul style="list-style-type: none"> • Avoidance reaction to ball 	<ul style="list-style-type: none"> • Shifts ball to bring bum into midline • Associative reaction of mouth 	N/A

Often Present

Majority of participants were extremely likely to perform *midline crossing* (80.8%-88.5%; n=84-92), to some degree, in this subtest. Results were relatively similar for the observable characteristics when performing this subtest on the left and the right side.

Participants were extremely likely to *not let go of the foil roll* (97.1%-98.1%; n=101-102), perform elbow flexion and extension (81.7%-84.6%; n=85-88) when hitting the ball and to perform smooth arm movements (76%-76.9%; n=79-80). Typically, bilateral integration needs to be in place before manual

midline crossing can occur, indicators of intact bilateral integration thus re-enforce that the sample presented with good midline crossing (McDougall, 2012; Kim, 2016, p.349; Stallings-Sahler, Reinoso & Frauwirth, 2019, p.CE1).

Majority of participants were able to *follow the instructions* (97.1%-98.1%; n=101-102) for this subtest. This is an important indicator, as this is a newly added subtest of the RCOs, which shows that the administration of instructions was effective. Additionally, this could indicate that participants were less likely to present with inattentive behaviour in this subtest.

Occasionally Present

Participants were slightly more likely to *shift their bum*, to bring the ball back into the midline line on their left side (37.5%; n=39) than on their right side (30.8%; n=32). This finding may correlate to the fact that majority of participants had a right-hand preference. Children make use of postural compensations such as shifting their bum to avoid contralateral reaching over the midline (Roach & Kephart, 1966).

Finally, an *associative reaction of the mouth* (29.8%-32.7%; n=31-34) was occasionally observed in participants. SAISI (2005) states that the presence of this observation may be indicative of nervous system immaturity.

Rarely Present

Participants were unlikely to present with an *avoidance reaction* (14.4%-16.4%; n=15-17) such as pulling away or excessive blinking. This observation may be indicative of defensive behaviour from the visual input of the ball swinging towards the child and added vestibular input as the child needs to pull their head back to avoid the ball coming into contact with them (Schaaf & Mailloux, 2015, p.25). This is an observation that is not expected to be present in a typically developing population.

Indicators of bilateral integration and sequencing difficulties were also assessed in this subtest such as rigid arm movements, maintaining elbows

extended and letting go of the foil roll. Participants were unlikely to *maintain their elbows extended* (15.4%-18.3%; n=16-18), *arms rigid* (23.1%; n=24) and *let go of the foil roll* (1.9%-2.9%; n=2-3).

Inattentive behaviour such as presenting with difficulty following instructions (1.9%-2.9%; n=2-3), was unlikely.

5.2.4. Tactile Touch Accuracy (TTA)

5.2.4.1. Measurable Characteristics

Majority of participants obtained a lower grade scoring of between 1 and 3 (67.3%; n=70) in this subtest. Majority of participants were able to identify between three and four body parts (30.8%-32.7%; n=32-34), this is similar to Miller (1988), who found that the five-year-old child is likely to identify four fingers, with the occlusion of visual input.

The researcher's decision to allocate a grade scoring of 3 to children who identified three body parts, may have skewed the data and resulted in more children presenting in a lower grade scoring rather than a higher-grade scoring. The researcher recommends that this be avoided in future studies. This is because the study found that children were more likely to present with SH parameters in this subtest than SNH parameters. The grade scoring may thus not be an accurate reflection of the five-year-old child's ability, in this subtest.

5.2.4.2. Observable Characteristics

Table 5.7 depicts the likelihood of a child to present with a given SH and SNH parameter in the TTA subtest.

Table 5. 7 The frequency with which observable characteristics were present for TTA

1		2	3
Rarely Present		Occasionally Present	Often Present
0.00%-24.99%		25.00%-74.99%	75.00%-100.00%
SH Parameters	N/A	<ul style="list-style-type: none"> • Able to identify index finger, forearm, thumb and dorsal aspect of forearm 	N/A
SNH Parameters	<ul style="list-style-type: none"> • Use of verbal prompts to try and identify a body part • Delayed response to touch • Cries • Hitting • Pulling a face • Moaning • Inattentive behaviour • Hyperactive behaviour 	<ul style="list-style-type: none"> • Inaccurate pointing to body part • Rubs or scratches location • Decreased eye contact 	N/A

Occasionally Present

Participants were very likely to *identify all the body parts* (64.7%-70.2%; n=67-73), they were expected to point to, with the occlusion of visual stimuli. Only by a marginal amount, the forearm was the observation which was identified accurately by the least number of participants (64.7%; n=67). The researcher suggests that this is because there is a smaller density of mechanoreceptors in the forearm in comparison to areas such as the thumb (Purves et al., 2001). The location of the forearm in relation to the sensory homunculus can also impact the accuracy with which the child could identify their forearm. In a study by Ackerley, Carlsson, Wester, Olausson and Wasling (2014, p.6) results indicated that participants presented with the highest tactile discrimination acuity when a sensory input was applied over their hand and forehead and participants presented with the most difficulty for tactile discrimination over their forearm, thigh and shin.

Rarely Present

Participants were unlikely to present with a *delayed response* when pointing to all body parts (4.8%-13.5%; n=5-14), with the thumb being the position, which was least likely to present with a delayed response, when identifying its location. This is in line with a study by Ackerley, Carlsson, Wester, Olausson

and Wasling (2014, p.6) which indicated that only 0.2g of force needed to be applied to the hand for discrimination to occur in comparison to the forearm which required at least 0.5g of force before a response was elicited by participants. No participants used *verbal prompts* to try and identify body parts.

When particularly looking at the emotional response of participants in this subtest, they were *unlikely to cry, hit, or moan* (0.9%-1.9%; n=1-2). Crying was only observed on one occasion, the researcher discussed this with the child's teacher, who admitted that the child was having social problems at home and that the child had cried in the class setting as well. The researcher counselled the teacher on how to contact therapists and social workers in the area, should the problem persist. Participants were more likely to present with a *passive emotional response* such as pulling their face (24%; n=25).

Participants were unlikely to present with *inattentive* (0.9%; n=1), and *hyperactive* (0%; n=0) behaviours when participating in this subtest.

5.2.5. Tactile Perception (TP)

5.2.5.1. Measurable Characteristics

Majority of participants received a grade scoring of between 4 and 5 in both the 2D and the 3D aspect of this subtest (75.9%-98.1%; n=79-99). Participants performed more accurately in the 3D aspect rather than the 2D aspect, which was expected. 2D perception is only identified by the cutaneous receptors of the hand and is far more refined than 3D perception which combines both cutaneous and proprioceptive signals to perceive an object (Berryman, Yau & Hsiao, 2006, p.27 ; Goodwin and Wheat 2004; Hsiao 2008; Klatzky, Loomis, Lederman, Wake & Fujita, 1993, p.170; Pont, Kappers & Koenderink, 1999, p.874).

When analysing the number of items children were able to identify, majority of participants were able to identify six objects in the 3D and 2D portion. Less participants were able identify all six items in the 2D (39.4%; n=41) portion in comparison to the 3D portion (83.7%; n=87). This once again supports that

children fared better in the 3D portion of this subtest. The Stereognosis subtest in the Miller Assessment of Pre-schoolers (MAP) similarly assesses identification of 3D objects with the occlusion of visual stimuli (Miller, 1988). Although this subtest and the MAP are not completely similar both correspond with one another to imply that the five-year-old child should present with well-established tactile perception. 3D tactile perception is also investigated in the EASI and the SIPT and the integration of these formal assessments with clinical observations is recommended (Mailloux, Parham & Smith Roley, 2019, p.3; Ayres, 1989). For the 2D portion of this subtest the researcher was unable to find a similar assessment to which she could compare her results.

5.2.5.2. Observable Characteristics

Table 5.8 depicts the likelihood of a child to present with a given SH and SNH parameter in the TP subtest.

Table 5. 8 The frequency with which observable characteristics were present for the TP

1		2	3
Rarely Present		Occasionally Present	Often Present
0.00%-24.99%		25.00%-74.99%	75.00%-100.00%
SH Parameters	N/A	N/A	<ul style="list-style-type: none"> • Can listen and follow instructions • Able to complete the entire activity
SNH Parameters	<ul style="list-style-type: none"> • Tries to redo initial try/compensates for mistake • Resistant to put hand in box • Shy to interact/avoidant • Decreased eye contact • Inattentive behaviour • Hyperactive behaviour 	<ul style="list-style-type: none"> • Attempts to look inside box • Difficulty finding an object • Does not want to maintain hand in box • Appears confused by the activity • Explosive emotions and anxiety • Associative reaction of mouth 	N/A

Often Present

Participants were extremely likely to *follow instructions* relayed to them (82.7%-96.2%; n=86-100), by the examiner. This is positive as this is a newly

added subtest and this confirms, that instructions were clear to all participants. An interesting observation is that participants presented with less difficulty following instructions in the 2D portion rather than the 3D portion, which was the easier of the two portions. The researcher hypothesises that the concept of this subtest may have been tricky to grasp and follow for some participants. To eliminate any difficulty following instructions, the researcher proposes that an example portion should be added. This will eliminate scoring bias.

No participants *refused to complete the activity*, which indicates it was not too demanding for the five-year-old child.

Occasionally Present

In both the 3D and 2D portion of this subtest majority of participants *attempted to look inside the box* (54.8%-55.8%; n=57-58) to use visual stimuli and *experienced difficulty finding objects in the box* (51.9%-53.9%; n=54-56). Participants were however less likely to *compensate for their mistakes* by attempting to redo their first attempt (0.9%-10.6%; n=1-11) when they struggled to find an object.

Participants were unlikely to *resist putting their hand in the box* (13.5%; n=14). Participants were however very likely not to want to maintain their hand in the box (58.7%; n=61).

Participants occasionally appeared *confused* (27.9%; n=29) or to present with *anxiety or explosive emotions* (26.9%; n=28). The researcher believes that this may have been due to difficulty initially following instructions, which once again confirms the need for an example portion for this subtest. The explosive emotions portion was initially intended to observe tactile defensive behaviour. It may however rather have indicated frustration experienced by children when following instructions. The researcher emphasises the importance of an example portion to eliminate an emotional response due to frustration with following instructions. If this is followed, it may increase the likelihood that

explosive emotions are due tactile defensive behaviour rather than difficulty following instructions, improving the credibility of this observation.

Participants also occasionally presented with an *associative reaction of mouth* (33.7%; n=35), which meant that the subtest required a large sum of concentration to complete.

Rarely Present

Participants were unlikely to be *shy to interact* (23.1%; n=24) with the activity.

Participants were unlikely to present with *decreased eye contact* in this subtest (16.4%; n=17).

Participants were less likely to present with most *hyperactive and inattentive behaviours*. The most commonly observed hyperactive behaviour was *struggling to maintain a seated position* (14.4%; n=15), this could be due to a number of reasons. Firstly, at this point participants were expected to concentrate for a duration of 15 minutes, which is the age norm for children to concentrate at this age and they may have reached the limit of their duration of concentration (Schmitt, 2016). This emphasises the importance of movement breaks during assessment procedures, to eliminate hyperactive behaviour(s). It could also be because children were anxious and presented with a fight or flight response, thereby attempting to avoid the activity. The cumulative tactile input may have also caused an activating response.

5.2.6. Proximal Joint Stability (PJS)

5.2.6.1. Measurable Characteristics

Majority of participants obtained a higher-grade score of between 4 and 5, for PJS of the left and right shoulders and hips (LHS & RHS) (67.4%-76%; n=70-79). Children fared better in the PJS of the RHS, majority of participants had a right-hand preference and thus had better control and stability of the right side of their body. For the PJS anterior to the hip (AH) and PJS posterior to the shoulder (PS) majority of participants obtained a higher-grade score of

between 4 and 5 (78.9%-81.8%; n=82-85). The initial hypothesis was that children would fare better in the hip stability than shoulder stability; the developmental sequence of the infant indicates that hip stability develops before shoulder stability, considering that the child sits before they are able to crawl (Louw & Louw, 2014, p.100). The researcher considers that the results indicate that at five-years shoulder and hip stability are beginning to develop simultaneously.

Results indicate that participants fared well in this subtest and that good hip and shoulder stability, with some postural compensations (See SNH Parameters) can be expected for the five-year-old child. This is the first pilot of this subtest. It is newly added to the RCOs. More research is required so that a comparison can be drawn with this study, to indicate whether these performance indicators are appropriate for the five-year-old child.

5.2.6.2. Observable Characteristics

Table 5.9 depicts the likelihood of a child to present with a given SH and SNH parameter in the PJS subtest.

Table 5. 9 The frequency with which observable characteristics were present for PJS

		1	2	3
		Rarely Present	Occasionally Present	Often Present
		0.00%-24.99%	25.00%-74.99%	75.00%-100.00%
SH Parameters	N/A		<ul style="list-style-type: none"> • No changes in posture 	<ul style="list-style-type: none"> • Maintains balance

SNH Parameters	<ul style="list-style-type: none"> • Hyperextension of elbows • Elbow flexion • Crossing ankles • Widens base of support • Does not weight bear on all four limbs • Loses balance • Moves hips to the side (RHS, AH & PS) • Lordosis • Rounded back (LHS & RHS) 	<ul style="list-style-type: none"> • Joints move in direction of force • Fixation of upper limbs • Moves hips to the side (LHS) • Rounded back (AH & PS) 	N/A
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Often Present

The ability to *maintain balance* was an extremely likely observation for all movements at the hips and shoulders (81.7%-94.2%; n=85-98). Participants were most likely to *maintain their balance*, when movement was anterior to their hips (94.2%; n=98). Balance in the five-year-old child should be relatively established to allow them to perform motor tasks such as jumping, skipping and kicking a ball without losing their balance (Wittenberg, 2009, p.37; Case-Smith, 2010, p.74; Louw & Louw, 2014, p.186). Since the vast majority of participants presented with this observation, it is likely to be expected of the five-year-old child.

Occasionally Present

No change in posture was occasionally observed for PJS, AH and PS (33.7%-37.5%; n=35-39). No changes in posture was sometimes observed for PJS of the LHS (39.4%; n=41) and observed in majority of participants for PJS of the RHS (51%; n=53).

Joints moving in the direction of force applied by the examiner were likely to be observed in all the portions of this subtest (47.1%-67.3%; n=49-70). When comparing all the portions of the PJS subtest, participants were least likely to have their joints move in the direction applied by the examiner for the PJS of the RHS, once again proportionate with a sample who had majority right hand preference.

To maintain their position and their mass over their support base, children occasionally *fixated their upper limbs* (33.7%-37.5%; n=35-39) in all sections of this subtest. *Moving hips to the side* was observed for PJS of the LHS (27.9%, n=29) and participants *rounded their back* when performing PJS, AH and PS (29.8%-34.6%; n=31-36). Children used hip strategies such as moving hips to the side, which Shumway-Cook & Woollacott (2012, p.289) state help add stability and thereby assist the child not to fall.

Rarely Present

Hyperextension of elbows was unlikely in all aspects of PJS (5.8%-7.7%; n=6-8).

In all portions of this subtest, participants were unlikely to react to the force applied by the examiner through flexing their elbows (1.9%-15.4%; n=2-16) and not *weight bearing on all four of their limbs* (5.8%-22.1%; n=6-23).

In all the portions of this subtest participants were unlikely to experience *difficulty maintaining their balance* (2.9%-22.1%; n=3-20). Participants were unlikely to *round their back* for PJS of the LHS and RHS (22.1%-24%; n=23-25) This indicates that although participants were able to maintain their balance, in all of the postures, a small sample relied on compensatory techniques to do so.

The following compensatory techniques to maintain balance, were unlikely to be observed: *widening their base of support* (1%-2.9%; n=1-3), *crossing their ankles* (6.7%-7.7%; n=7-8) and fixating their back into *lordosis* (2.9%-7.7%; n=4-8).

5.2.7. Slow Movements (SM)

5.2.7.1. Measurable Characteristics

Majority of participants obtained a lower grade scoring of between 1 and 3 (70.8%; n=73). This indicated that they had difficulty completing the sequence for a duration of between 12 and 16 seconds.

Participants were able to complete the slow movements sequence for a median of 10 seconds, which equates to a grade score of 3. The slow-motion test in the COMPs expects a child to perform the test in 6 seconds, therefore participants performed this test within age norms (Wilson, Pollock, Kaplan, Law & Faris, 1992, p.777). The interquartile range was between 5-37 seconds. SAISI (2005) indicate that a higher-grade score can only be allocated for this subtest if a child performs the sequence in 12-16 seconds, but do not specify age norms. It is clear that five-year-old children in this study completed the sequence in slightly less time than the norm, which possibly indicates that the norm in the current format of the COs is not appropriate for the five-year-old child. This may indicate that although majority of children obtained a lower grade scoring, results may have been skewed by using the norms by SAISI (2005) to allocate grade scoring.

5.2.7.2. Observable Characteristics

Table 5.10 depicts the likelihood of a child to present with a given SH and SNH parameter in the SM subtest.

Table 5. 10 The frequency with which observable characteristics were present for SM

		1	2	3
		Rarely Present	Occasionally Present	Often Present
		0.00%-24.99%	25.00%-74.99%	75.00%-100.00%
SNH Parameters	N/A		<ul style="list-style-type: none"> Well controlled shoulder movements 	<ul style="list-style-type: none"> Full extension of elbows Shoulder abduction to 90°
SNH Parameters	<ul style="list-style-type: none"> Unable to maintain feet flat on ground Widens base of support 		<ul style="list-style-type: none"> Shoulders dropping Smooth fluid movements Rigid arm movements Visually monitoring movement Associative reaction of mouth Slouched seated posture 	<ul style="list-style-type: none"> Some left right differences

Often Present

Majority of participants presented with *left right differences* when performing this subtest. This finding corresponds with SAISI (2005), who indicate that the presence of some left-right differences is typical for the five-year-old child.

Occasionally Present

Majority of participants were able to bring both their arms back (78.6%; n=81) to their shoulders.

Although the grade scoring depicts poor performance in this subtest, participants were very likely to extremely likely to *control their shoulder movement* (54.4%; n=56), present with *smooth movements* (56.3%; n=58), *extend their elbows fully* (76.7%; n=79) and *fully abduct their shoulders* (76.7%; n=79). This is congruent with the current format of the COs by SAISI (2005), which states the five-year-old child is likely to execute this movement in a smooth and symmetrical fashion. It is important to note that grade scoring was based on the number of seconds participants were able to complete the slow movements, not necessarily the quality of their movements.

When taking a closer look at the SH parameters, it becomes apparent that participants have a relatively even chance of presenting *with shoulders dropping* (45.6%; n=47) or presenting with *good shoulder control* (54.4%; n=56). Shoulders dropping is an indication of poor shoulder stability. In the PJS subtest, majority of participants presented with good shoulder stability, which contrasts the results of this subtest. It is possible that participants struggled to coordinate their movement due to delays in proprioceptive discrimination.

Participants were likely to *visually monitor their movement* (27.2%; n=28), in order to give additional visual feedback. The researcher posits that this was to give additional feedback to their sensory-motor systems to attempt to accurately execute this movement (SAISI, 2005, p.60).

Participants were very likely to present with an *associative reaction of their mouth* (54.4%; n=56), which indicates that they were concentrating intensively during this subtest.

Not all participants were successful with maintaining postural control and as a result participants were likely to *slouch in their seat* (27.2%; n=28).

Rarely Present

In this subtest a small sample of participants made use of compensatory techniques to maintain their balance. Participants were unlikely to *widen their base of support* (13.6%; n=14), but even less likely to *cross their ankles* (6.8%; n=7). This indicates that poor postural ocular control was an unlikely observation in this sample of typically developing children.

Participants were unlikely to experience *difficulty maintaining their feet flat on the floor* (18.5%; n=19).

Some participants presented with a *unilateral return of a hand to a shoulder*, although this was less likely, 20.4% (n=21) participants returned their left hand first and only 1% (n=1) of participants returned their right hand first. The hand which normally returns first to the starting position, is usually on the side of the weaker shoulder (SAISI, 2005). Majority of participants had a right-hand preference. It is possible that this is why there was a higher incidence of left hands returning to left shoulders than right hands returning to right shoulders, as the left shoulder would naturally be their weaker side.

5.2.8. Eye Tracking (ET)

5.2.8.1. Measurable Characteristics

Majority of participants obtained a grade score of between 4-5 in the visual pursuits (72.1%; n=75), bilateral midline crossing (75%; n=78), midline crossing of the left eye (59.6%; n=62), midline crossing of the right eye (63.5%,

n=66), convergence (61.2%; n=62) and quick localisation (79.8%; n=83). Results are congruent with SAISI (2005, p.58) who state that smooth eye movements are a reasonable expectation for the five-year-old child.

It is evident that majority of participants in this study did not present with difficulty performing the eye tracking subtest. Dysfunction in this subtest, by the five-year-old child may thus be indicative of vestibular-ocular dysfunction.

5.2.8.2. Observable Characteristics

Table 5.11 depicts the likelihood of a child to present with a given SH and SNH parameter in the ET subtest.

Table 5. 11 The frequency with which observable characteristics were present for ET

		1	2	3
		Rarely Present	Occasionally Present	Often Present
		0.00%-24.99%	25.00%-74.99%	75.00%-100.00%
Visual Pursuits				
SH Parameters	N/A	<ul style="list-style-type: none"> Smooth Coordinated eye movements Eyes move independently from head 	<ul style="list-style-type: none"> Visual Fixation on object 	
Midline Crossing (Both Eyes)				
SH Parameters	N/A	N/A	<ul style="list-style-type: none"> Visual Fixation on object Smooth Coordinated eye movements Eyes move independently from head 	
Midline Crossing (Left and Right Eye)				
SH Parameters	N/A	<ul style="list-style-type: none"> Smooth Coordinated eye movements 	<ul style="list-style-type: none"> Visual Fixation on object Eyes move independently from head 	
SNH Parameters	N/A	<ul style="list-style-type: none"> Loses focus when crossing the midline 	N/A	
Convergence				
SH Parameters	N/A	<ul style="list-style-type: none"> Visual fixation on object 	<ul style="list-style-type: none"> Eyes move independently from head 	

SNH Parameters	N/A	<ul style="list-style-type: none"> Rigid eye movements 	N/A
Quick Localisation			
SH Parameters	N/A	<ul style="list-style-type: none"> Eyes move independently from head 	<ul style="list-style-type: none"> Visual fixation on object Smooth Coordinated eye movements
SNH Parameters	N/A	<ul style="list-style-type: none"> Makes use of head movements 	N/A
General Observations			
SNH Parameters	<ul style="list-style-type: none"> Eyes water 	<ul style="list-style-type: none"> Excessive Blinking Associative Reaction of mouth Slouches in seat 	N/A

Often Present

Most of the SH parameters were often present for all aspects of visual tracking. This supports the suggestion mentioned under measurable characteristics, that majority of five-year-old children should present with some of the SH parameters.

Visual fixation on the object was often observed in all components of this subtest, except for convergence and unilateral midline crossing (right and left eye) (78.9%-90.4%; n=82-94). Bilateral eye movements integrate as early as 3 years and develop before unilateral eye movements, it is thus reasonable to expect that five-year-old children fared better in the bilateral midline crossing versus the unilateral midline crossing (Gilligan, Mayberry, Stewart, Kenyon & Gaebler, 1981, p.253-254).

Smooth coordinated eye movements were frequently observed for bilateral midline crossing (79.8%, n=83) and quick localisation (79.8%, n=83). Dunn (1981, p.4) found that one should begin to expect smooth coordinated eye movements in the five-year-old child. Gilligan, Mayberry, Stewart, Kenyon and Gaebler (1981) identified that by six-years eye tracking matures and fully

integrates at eight years, the researcher suggests that this may account for not all participants presenting with smooth eye tracking.

Eye movements independent of head movements were often seen in the midline crossing and convergence subtests (77.9%-94.9%, n=81-97). Convergence is however an eye movement only focused at the midline and because it does not demand vertical or horizontal eye movements, the researcher believes this is why participants were least likely to present with head movements.

Occasionally Present

Smooth coordinated eye movements were observed in majority of participants in visual pursuits (66.4%; n=69). In comparison to the other sub-items smooth coordinated eye movements were least likely to be observed for visual pursuits which is congruent with available literature (Poulsen & Peachy, 1983, p.19; De Gangi, Berk & Larson, 1980, p.452).

Majority of participants lost focus when *crossing the midline* with their right and left eye (51-52.9%; n=53-55). Marginally more participants had difficulty with right midline crossing. Majority of participants presented with a left eye preference which may account for participants having most difficulty with crossing the midline with their right eye (non-preferred eye). Intrusive saccades when crossing the midline, observed in unilateral midline crossing have been observed in neurodevelopmental disorders (Sumner, Hutton, Kuhn, & Hill, 2016; p.5; Schmitt, Cook, Sweeney & Mosconi, 2014, p.6; Wilkes, Carson, Patel, Lewis & White, 2015, p.338). According to Gilligan, Mayberry, Stewart, Kenyon and Gaebler (1981) and Poulsen and Peachy (1983, p.17) midline jerks are atypical for the five-year-old child. The researcher proposes that more research needs to confirm whether the presence of a midline jerk is atypical for the five-year-old child.

Eye movements independently from head were observed for majority of participants in visual pursuits (61.5%; n=64) and quick localisation (54.8%, n=57). However, in comparison to the other sub-items, participants were more

likely to make use of head movements for visual pursuits and quick localisation (38.5%-46.2%; n=40-48). Over exaggerated head movements can indicate motor control difficulties and possibly the inability to suppress the vestibular-ocular reflex (Gauthier, Nommay & Vercher, 1990, p.161 & Gauthier, Semmlow, Vercher, Pedrono & Obrecht, 1991). Studies do however indicate that head movement in 50% of five-year-old children may still be typical (Peters, Romine & Dykman, 1975; Gilligan, Mayberry, Stewart, Kenyon & Gaebler, 1981 & Poulsen & Peachy, 1983, p.19).

Participants occasionally made use of postural-ocular compensatory mechanisms such as *excessive blinking* (39.4%; n=41) and *slouching in their seat* (28.9%; n=30).

An associative reaction of mouth was observed by just under half of participants (43.3%; n=45). It may be an indicator of neurodevelopmental delay. Literature suggests that the presence of overflow movements such as an associative reaction of mouth can be linked to lack of inhibition of the cortico-spinal motor system, which is situated over the extra-pyramidal system (Stallings-Sahler, Reinoso & Frauwirth, 2019, p. CE-2). This together with the presence of primitive reflexes substantiate that participants with neurodevelopmental delay may have been included in the study population and thereby missed in the school screening system.

Rarely Present

Eyes watering (23.1%; n=24) was infrequently observed.

5.2.9. Tongue and Lip Movements (TLM)

5.2.9.1. Measurable Characteristics

Tongue Movements (TM)

Participants were most likely to obtain a grade score of 1-3 (51.7%; n=54) in the up-down movement. Poulsen and Peachy (1983, p.20) found that five-year-old children have the most difficulty with this subtest and particularly the up-tongue movement.

Majority of participants obtained a grade scoring of 4-5 in the side-to-side tongue movements (90.4%, n=94). This implies that this was the easiest movement to complete by the five-year-old child. Difficulty to complete this movement may thus be an indicator of dysfunction.

In the circular tongue and tongue wagging movements, there was a relatively even distribution of participants who scored between 1-3 (46.1%-50.1%; n=48-52) and 4-5 (50.1%-53.9%, n=52-56), with slightly more participants obtained a score of 4-5.

The researcher theorizes that tongue movements follow the following developmental sequence:

- I. Side to side tongue movements
- II. Down tongue movement
- III. Up tongue movement
- IV. Circular tongue movements
- V. Tongue wagging

The researcher developed this sequence by analysing the performance of the study sample in each tongue movement and sequencing them from easiest to most difficult for five-year-old children to perform. A larger theoretical base of knowledge is required to prove this theory and for this reason, the researcher recommends that more research be done on the developmental sequence of tongue movements.

Mouth Movements (MM)

In both the kissing (76%, n=79) and blowing up cheeks face (90.4%, n=94), participants were most likely to obtain a higher-grade score of between 4-5. When comparing higher grade scores of the mouth movements it is evident that participants experienced marginally more difficulty with the kissing movement than the blowing up cheek's movement. The inability to imitate oral movements is termed oral dyspraxia and can impact speech and feeding ability of the child; thereby it is expected that a typically developing population would

not present with difficulty in this subtest (Ayres, 1989; Stallings-Sahler, Reinoso & Frauwirth, 2019, p. CE-4).

The researcher thus theorises that the mouth movements follow the following developmental sequence:

- I. Blow up cheeks
- II. Kissing face

More research is however required to prove or disprove this theory. Only two mouth movements were investigated in this subtest, Ayres (1989) suggests that more oral motor movements are needed to decide whether a child has verbal dyspraxia. She suggested movements such as clicking teeth and protruding the tongue. The researcher suggests that these mouth movements should be included in the final format of the Revised Clinical Observations, to provide a comprehensive picture of the child's oral motor function.

Participants were able to maintain the kissing face and the blow-up cheeks face for a median of 10 seconds. The interquartile range for the kissing face was between 0-10 and for the blow-up cheeks face it was between 3-10. When specifically, analysing frequencies it becomes evident that more participants weren't able to maintain the kissing face (9.6%, n=10), in comparison to the blow-up cheeks face (0%, n=0). This once again proves that participants experienced more difficulty holding the kissing face in comparison to the blow-up cheeks face.

Mouth movements in the field of speech therapy are referred to as nonspeech orofacial movements (NSOM), it is interesting to note that within the last two decades many speech therapists have chosen to omit the assessment of NSOM in developmental sound disorders and are more likely to assess the quality of the child's sounds rather than the quality of their mouth movements (Forrest, 2002; Lof & Watson 2008; Powell, 2008; Ruscello, 2008; Weismer, 2006). This presents the question whether mouth movements are rather an

indicator of poor oral praxis rather than an indicator of speech and language delay.

5.2.9.2. Observable Characteristics

Tongue Movements

Table 5.12 depicts the likelihood of a child to present with a given SH and SNH parameter in the TM subtest.

Table 5. 12 The frequency with which observable characteristics were present for the TM

		1	2	3
		Rarely Present	Occasionally Present	Often Present
		0.00%-24.99%	25.00%-74.99%	75.00%-100.00%
Up and down				
SH Parameters	N/A		<ul style="list-style-type: none"> Accurately completes up movement 	N/A
SNH Parameters	<ul style="list-style-type: none"> Cannot complete down movement Associative movement of head and jaw Reduced speed of motion Jerky movement 		<ul style="list-style-type: none"> Cannot complete up movement 	N/A
Side to Side				
SH Parameters	N/A		N/A	<ul style="list-style-type: none"> Accurately completes movement
SNH Parameters	<ul style="list-style-type: none"> Associative movement of head and jaw Tongue jerks in corner of mouth Reduced speed of motion Jerky movement 		N/A	N/A
Circular				
SH Parameters	N/A		<ul style="list-style-type: none"> Accurately completes movement 	N/A

SNH Parameters	<ul style="list-style-type: none"> • Associative movement of head and jaw • Tongue jerks in corner of mouth • Reduced speed of motion 	<ul style="list-style-type: none"> • Jerky movement 	N/A
Tongue Wagging			
SH Parameters	N/A	N/A	<ul style="list-style-type: none"> • Accurately completes movement
SNH Parameters	<ul style="list-style-type: none"> • Associative movement of head 	<ul style="list-style-type: none"> • Associative movement of jaw • Tongue jerks in corner of mouth • Reduced speed of motion • Jerky movement 	N/A
General Observations			
SNH Parameters	<ul style="list-style-type: none"> • Involuntary tongue protrusion 	<ul style="list-style-type: none"> • Slouches in seat • Dribbling • Difficulty sustaining tongue protrusion • Purses lips 	N/A

Often Present

Participants were extremely *likely to be able to perform* the side to side (98.1%, n=102) and tongue wagging (83.7%, n=87) movements. SAISI (2005) and Poulsen and Peachy (1983) agree that it is reasonable for the five-year-old child not to experience difficulties with these sub-items.

Occasionally Present

Majority of participants could perform the circular tongue movement (70.2%, n=73). SAISI (2005) states that 95% of five-year-old children should be able to complete the circular movement. Whilst the results are not completely congruent with literature, this study still proves that majority of five-year-old children can perform the circular tongue movement. Participants were also very likely to accurately perform the up down (59.6%, n=62) tongue movements. When specifically comparing all the tongue movements it is evident that participants had the most difficulty with the up, down tongue movement.

The MAP indicates that majority of five-year-old children should be able to perform the side to side, up and down and circular tongue movements (Miller, 1988, p.56). These results are congruent with the results of this study.

The researcher postulates that the reason why participants were able to better complete the circular movement in comparison to the up-down movement is because they are typically developing children, implying that their feedforward system should be in place. The researcher hypothesises that although the circular tongue movement has an up-down component, participants managed to practice this movement in the up-down tongue movement, which was completed before the circular tongue movement and the feed-forward system helped participants to distinguish how to perform the movement accurately.

Participants were likely not to be able to complete the up down movement (50%, n=52). In the up, down movement, participants marginally had more difficulty performing the tongue up (36.5%, n=38) portion of the movement in comparison to the tongue down movement (13.5%, n=14). Similar results were found by Poulsen and Peachy (1983, p.20) who identified that 31% of five-year-old children experienced difficulty with the up movement.

Participants were likely to present with a *jerky tongue movement* in the circular tongue movement (42.3%, n=44). Participants were extremely likely to present with a *jerky movement* in the tongue wagging portion of this subtest (63.5%, n=66). Kuhn and Phelps (1979) state that smooth side to side tongue movements can be expected for the seven-year-old child thereby proposing that it is fair that participants experienced difficulty coordinating this movement.

Finally, participants were most likely to perform with a *tongue jerk* (28.9%, n=34), in the corner of their mouth, in the tongue wagging section of the subtest, out of all the sections. Based on the observations, it is evident that participants had the most difficulty with the coordination and sequencing of the tongue wagging subtest.

Decreased speed of the tongue movement (32.7%, n=34) was a likely observation for the tongue wagging movement, but unlikely for the remainder of the tongue movements.

Both the speed of tongue movement and likelihood of jerky movement, implies that the bilateral coordination and sequencing of the five-year-old child in the tongue wagging subtest, may still be immature, thereby jerky tongue movements and decreased speed of movement may not be an indicator of dysfunction. More research will need to be completed to confirm this observation.

The presentation of *involuntary tongue protrusion* was unlikely, which may indicate that the presence of this observation in the five-year-old child, may be an indicator of dysfunction. Participants occasionally *slouched in their chair* (30.8%, n=32), *dribbled* (46.2%, n=48) and presented with *difficulty sustaining tongue protrusion* (32.7%, n=34) in this subtest. Majority of participants tended to *purse their lips* (54.8%, n=57) when performing this subtest, the presence of this observation in typical five-year-old children may thereby not be an indicator of dysfunction.

Rarely Present

In terms of *associative movements of the jaw or the tongue*, participants were unlikely to perform with an associative movement in the up down, side to side and circular tongue movements. The presentation of associative movements in these tongue movements, could thus be indicators of dysfunction. For the tongue wagging movement associative movement of the jaw (27.9%, n=29) was likely, which may indicate that this is not an indicator of dysfunction in the five-year-old child.

Mouth Movements

Table 5.13 depicts the likelihood of a child to present with a given SH and SNH parameter in the MM subtest.

Table 5. 13 The frequency with which observable characteristics were present for the MM

1		2	3
Rarely Present		Occasionally Present	Often Present
0.00%-24.99%		25.00%-74.99%	75.00%-100.00%
Kissing and blow up cheeks faces			
SH Parameters	N/A	N/A	<ul style="list-style-type: none"> • Able to assume both facial expressions
SNH Parameters	<ul style="list-style-type: none"> • Inability to assume both facial expressions for at least 10 seconds • Drooling in both expressions 	<ul style="list-style-type: none"> • Air escaping from lips in the blow-up cheek's facial expression 	N/A

Often Present

Participants were extremely likely to be able to assume the kissing face (91.4%, n=95) and blowing up cheeks face (98.1%, n=101) and hold both expressions (76%-91.4%, n=79-95) for 10 seconds. Participants had marginally more difficulty holding the kissing face than the blow-up cheeks face.

Occasionally Present

Air escaping from lips in the blow-up cheeks face (26%, n=27) was occasionally observed. It is possible that the presence of this observation in the five-year-old child is an indicator of dysfunction.

Rarely Present

Inability to push lips forward was infrequently observed (24%; n=25). No participants presented with drooling when performing this subtest. The presence of this observation in mouth movements might thus be associated to oral-motor dysfunction in the child.

5.2.10. Jumping (J)

5.2.10.1. Measurable Characteristics

Participants performing the jumping sequence (62.5%, n=65) were most likely to obtain a grade score of between 4-5, which indicates they had little to no difficulties performing this sequence. This is congruent with the norms in the Clinical Observations of Gross Motor Items (COGMI) (SAISI, 2004). In the jump hop sequence (80.8%, n=84), participants were most likely to obtain a grade score of between 1-3, which indicates that majority of participants experienced difficulties when performing this subtest. In the COGMI, children are only expected to accurately perform this sequence at 6 years of age, the results are thus congruent with literature (SAISI, 2004). In the jumping with legs open and closed subtest, participants were most likely to obtain a grade score of between 4-5 (54.8%, n=57), however this is only marginally more than the participants that obtained a grade score of between 1-3 (45.2%, n=47).

When ordering the developmental progression of jumping sequences, according to grade scores and age norms, the researcher posits that children are able to perform the sequences in the following developmental order (SAISI, 2004):

- I. Jump Sequence by five years – five years six months (SAISI, 2004)
- II. Jumping with legs open and closed by five years six months - five years eleven months
- III. Jump hop sequence by six years - six years, five months (SAISI, 2004)

More research will need to be done to prove this theory.

5.2.10.2. Observable Characteristics

Table 5.14 depicts the likelihood of a child to present with a given SH and SNH parameter in the J subtest.

Table 5. 14 The frequency with which observable characteristics were present for J

1		2	3
Rarely Present		Occasionally Present	Often Present
0.00%-24.99%		25.00%-74.99%	75.00%-100.00%
Jumping Sequence			
SH Parameters	N/A	<ul style="list-style-type: none"> Continuous movement in sequence Controlled stop 	<ul style="list-style-type: none"> Jumps with feet together Follows sequence
SNH Parameters	<ul style="list-style-type: none"> Abducts arms more than 15° Finishing beyond the 4m marker Asks or requires instructions to be repeated 	<ul style="list-style-type: none"> Maintains leg stiff or in extension Poor Rhythm Flexes elbows Poorly graded landing Associative reaction of mouth Fixates arms 	N/A
Jump Hop Sequence			
SH Parameters	N/A	<ul style="list-style-type: none"> Jumps with feet together Continuous movement in sequence 	N/A
SNH Parameters	<ul style="list-style-type: none"> Maintains legs stiff or in extension Finishing beyond them mark Asks or requires instructions to be repeated 	<ul style="list-style-type: none"> Unable to accurately execute sequence Starts and stops the sequence Poor rhythm Cannot control stop Abducts arms more than 15° Flexes elbows Poorly graded movement Associative reaction of mouth Fixates arms 	N/A
Jumping with legs open and closed			
SH Parameters	N/A	<ul style="list-style-type: none"> Continuous movement in sequence 	<ul style="list-style-type: none"> Jumps with feet together Follows sequence
SNH Parameters	<ul style="list-style-type: none"> Finishing beyond them mark Asks or requires instructions to be repeated Criss crosses legs 	<ul style="list-style-type: none"> Starts and stops the sequence Poor rhythm Cannot control stop Abducts arms more than 15° 	N/A

		<ul style="list-style-type: none"> • Flexes elbows • Poorly graded movement • Associative reaction of mouth • Fixates arms 	
--	--	--	--

Often Present

Jumping with feet together was observed in majority of participants in the jumping (97.1%, n=101) and open and closed (85.6%, n=89) sequences.

Accurately following the sequence was often observed in both the jumping (95.2%, n=99) and open and closed sequences (80.8%, n=84). According to SAISI (2005), children between the age of four and five, should be able to complete the jumping sequence. Results also indicate that five-year-old children should be able to accurately execute the open closed sequence.

Occasionally Present

Jumping with feet together, was a likely observation in the jump hop sequence (53.9%, n=56).

Participants occasionally performed the jump hop sequence *accurately* (41%, n=41), this correlates with the grade scoring, which indicates that participants presented with the most difficulty in the jump hop sequence (SAISI, 2004).

Continuous movement throughout the sequence was observed in majority of participants in the jumping (65.4%, n=68) and open and closed sequences (73.1%, n=62). It was occasionally observed in the jump hop sequence (48.1%, n=50).

A *controlled stop* was observed by majority of participants in the jumping (68.3%, n=71) and open and closed (59.6%, n=62) sequences. A *controlled stop* in the jump hop sequence (31.7%, n=33) was occasionally seen.

Difficulty jumping with feet together in the hop portion of the jump hop sequence (47.1%, n=49) was a likely observation.

Maintaining legs stiff or in extension was a likely observation seen in the jumping sequence (48.1%, n=50) and legs open and closed sequence (37.5%, n=39). It was an unlikely observation in the jump hop sequence.

Starting and stopping the sequence was a likely observation for the jumping (30.8%, n=32) and the jump hop (53.9%, n=56). It was an unlikely observation in the open and closed sequence.

Poor rhythm was a likely observation in the jumping (39.4%, n=41) and legs open and closed (44.2%, n=46) sequences. It was observed in majority of participants in the jump hop sequence (67.3%, n=70).

Inability to control the stop of the sequence was occasionally observed in the jumping (33.7%, n=35) sequence. Majority of participants had difficulty *controlling their stop* in the legs open and closed (66.4%, n=69) sequence. It was sometimes observed in the jump hop (41.4%, n=43) sequence.

Abducting arms more than 15° was sometimes observed in the jump hop (47.1%, n=49) and open closed (41.4%, n=49) sequences.

Flexing elbows was occasionally observed in the jumping (42.3%, n=44) sequence. It was observed in majority of participants in the jump hop (55.8%, n=58) and open closed (52.9%, n=55) sequences.

In all the components of this subtest (26.9%-32%, n=28-32) participants occasionally presented with difficulty *grading their movements*.

Participants occasionally *fixated their arms* in the jumping (34.6%, n=36) and legs open and closed (42.3%, n=44) sequences and majority of participants did so in the jump hop (55.8%, n=58) sequence.

Rarely Present

In all the components of this subtest, participants were unlikely to *ask or require instructions to be repeated* (0%-8.7%, n=1-9). This is particularly of interest for the open and closed sequence as this is a newly added item in the RCOs and indicates that the administration procedures are clear and can be used for the RCOs manual. Participants rarely *finished sequences beyond the 4m line* (0-8.7%; n=0-9), indicating intact visual discrimination and developing proprioceptive discrimination. The researcher concludes that the added visual input allowed improved proprioceptive discrimination in comparison to children performing the slow movements subtest. No participants *jumped beyond the 4m mark in the final sequence*, the researcher believes this to be associated to accurate feedback from their sensory systems and feedforward in their motor action of maintaining within the 4m line. Interestingly *criss-crossing of legs* (11.5%, n=12), although seldom observed was more frequently observed than jumping beyond the 4m mark. This may indicate difficulties with proprioceptive discrimination as participants were unable to use visual input to correct their movements and relied solely on proprioception to position their feet so they landed together.

5.2.11. Ideation Challenge (IC)

5.2.11.1. Measurable Characteristics

Participants were most likely to obtain a grade score of between 1-3. This indicated that participants presented with difficulties when performing this subtest.

Due to the fact that majority of participants obtained a grade score of 1-3, they were more likely to identify between 0-8 “ables”. The scoring criteria for the Test of Ideational Praxis (TIP), indicate that on average, five-year-old children should be able to identify 16.2 Ables and that the ability of the child to identify less than 8.6 “ables” was indicative of dysfunction (May-Benson, 2005). Children in this study identified less Ables than the average identified by May Benson in the TIP. This could indicate that five-year-old South African (SA)

may have more difficulty with ideational praxis, although it may be because the testing equipment in the TIP (a shoelace), differed to the testing equipment in this study (a face cloth). The researcher does however posit that an administration in which examples are given of ideation, such as that in the EASI, would improve the scoring of participants. The researcher concludes that more research will need to be completed on this subtest, in order to reach a conclusion of the performance of the five-year-old child.

5.2.11.2. Observable Characteristics

Table 5.15 depicts the likelihood of a child to present with a given SH and SNH parameter in the IC subtest.

Table 5. 15 The frequency with which observable characteristics were present for the IC

		1	2	3
		Rarely Present	Occasionally Present	Often Present
		0.00%-24.99%	25.00%-74.99%	75.00%-100.00%
SH Parameters	<ul style="list-style-type: none"> • Clean • Put on floor • Stand on • Pendulum swing • Wring • Pass around body • Fan • Spin in circle • Bite • Throw • Twirl • Whip • Jump over 	<ul style="list-style-type: none"> • Wash • Scrunch • Wrap around • Stretch between two arms • Hold against body • Fold • Other 	N/A	
SNH Parameters	<ul style="list-style-type: none"> • Inattentive behaviour • Tries to incorporate other objects in the activity 	<ul style="list-style-type: none"> • Explosive emotions • Shy to interact with wash cloth • Uses language to describe the activity instead of demonstrating actions 	N/A	

Often Present

None.

Occasionally Present

Children were likely to ideate the *wash body, scrunch, wrap around body, stretch between two arms, hold against body and fold able*. Many children from informal settlements have preconceived ideas of the properties and function of a wash cloth. Their environmental exposure may account for the tendency to fold (58.7%; n=61) and wash (29.8%; n=31) with the washcloth.

Majority of participants used *language to describe the activity rather than demonstrating actions* (56.7%; n=59). This is a compensatory strategy; children tend to use when they experience difficulty with ideation.

Other tasks not included by the researcher in the scoring criteria were occasionally observed.

Participants were occasionally *shy when interacting with the activity* (27.9%; n=29) and presented with *explosive emotions* (32.7%; n=34). Explosive emotions refer to any form of negative emotional expression such as pulling a face, signs of frustration such as quickly giving up and clear discomfort. The researcher posits that this may be because some participants found the activity difficult and were avoidant thereby causing a fight, flight or freeze response during the activity.

Rarely Present

No participants were able to ideate the *pass around body task*. Participants rarely performed the following tasks: *clean, put on floor, stand on, pendulum swing, wring/twist, fan, spin in circle, bite, throw, twirl, whip and jump over* (1%-24%; n=1-25).

Participants were unlikely to present with *inattentive behaviour* during this subtest (5.8%; n=6). Participants were also likely to try and *incorporate other objects in the activity* (10.6%; n=11). The presentation of these observations in the five-year-old child are thereby atypical.

5.3. A comparison of gender difference between participants in the 11 subtests of the Revised Clinical Observations (RCOs)

No gender differences were found in the performance of participants in the ATNR, RIP, STNR, BBH, TTA, TP, PJS, SM and IC subtests.

When comparing the grade scoring of boys and girls in the ET, TLM and jumping subtest, it became evident that girls were more likely to obtain a higher-grade scoring in certain components. The researcher will now follow with a brief discussion of each subtest, where gender differences were found:

5.3.1. Eye Tracking (ET)

A statistically significant difference in grade scores could be drawn between girls and boys in visual pursuits and convergence eye movements which indicated that girls fared better than boys in this subtest. Observable characteristics additionally identified that girls were more likely to *visually fix their eyes on the object* and perform *eye movements independent from their head* in the visual pursuits sub-item and perform *smooth eye movements* in the convergence sub-item.

Whilst limited research could be found specifically describing eye tracking between boys and girls. Studies could be found describing gender bias in eye tracking such as the gender of the examiner, the interest level the child has in the object (properties such as colour can impact this), the emotional attachment of the child to an object, the child's own attention level (Coutrot, Binetti, Harrison, Mareschal & Johnston, 2016, p.16; Mak, Hu, Zhang, Xiao & Lee, 2009). Studies found that boys fare better when the examiner is female and when the object is a colour, they prefer such as green. It is interesting that boys still fared poorer than girls considering that the examiner was female and the object used for eye tracking was green. The research does not believe bias impacted the performance of boys in this study. Follow up studies investigating

to what extent these factors influence gender differences in eye tracking are recommended.

The researcher agrees with the notion by Blignaut, Janse Van Rensburg and Oberholzer (2019), that manual eye tracking is subject to error and adds that a large sum of bias may exist when performing manual eye tracking.

5.3.2. Tongue and Lip Movements (TLM)

5.3.9.1. The difference in performance between girls and boys in the TLM subtest

There was a statistically significant difference in the performance of boys and girls in the TLM subtest, with girls performing better than boys in the BC face.

The researcher could not find literature which supports this phenomenon and reports that more research needs to be completed on this topic.

5.3.3. Jumping (J)

There was a statistically significant difference between boys and girls for the grade scoring of the jumping, jump hop and legs open and closed sequences. Traditionally literature suggests that boys outperform girls in gross-motor tasks because they naturally have more strength and agility (Palmer, Harkavy, Rock & Robinson, 2020, p.1). Jumping sequences assess bilateral integration and sequencing, which indicates neurodevelopmental integrity and not only biomechanical mechanisms such as muscle strength. A study by Pollatou, Karadimou and Gerodimos (2005) indicated that girls fared better in activities that required rhythm and sequencing. According to the measurable characteristics girls were less likely to complete the jumping sequence with *poor rhythm* and *start and stop the sequence*. Matarma, Lagstrom, Loyttyniemi and Koski (2020, p.367) found in a sample of 712 Finish children that girls outperformed boys in the Bruininks-Oseretsky Test of Motor Proficiency. Another study by Venetsanou and Kambas (2016, p.7) found in 540 Greek children completing the Bruininks-Oseretsky Test of Motor Proficiency- Long form, that boys were more successful in agility, running speed, strength and upper limb

coordination subtests whereas girls performed better in bilateral integration, upper limb speed and dexterity subtests. Fairbairn et. al. (2020) found differences between boys and girls in the performance of the Movement Assessment Battery for Children (M ABC-2) that girls out-performed boys.

The researcher also hypothesis when looking specifically at activity engagement, that girls are more likely to engage in sequencing tasks such as hop scotch and rhythm clap games, which may influence their ability to outperform boys in this subtest.

5.4. SUMMARY OF CHAPTER

The results of the study were discussed in this chapter. The demographic information of participants was briefly described, followed by a discussion of each of the 11 subtests of the RCOS.

The results presented in this chapter addressed the aim of the study which was to describe the performance of typical five-year-old children on 11 subtests of the Revised Clinical Observations by SAISI (2016). The objectives were met for the previously included and newly added subtests:

The measurable and observable characteristics for the BBH, TTA, SM, ET, TLM and J subtests, were consistent with literature. Similarly, to Potgieter (2018), the performance of participants in the ATNR, RIP and STNR subtest were inconsistent with literature, posing whether literature is in line with the performance of SAn children in these subtests. The researcher also struggled to find literature to support her results in the PJS, as this is a newly added subtest in the RCOs. The researcher's results for the IC subtest were not consistent with literature, suggesting that the administration for this subtest may need to be altered or that more researcher needs to be done to determine conclusive results.

No gender differences were found in the performance of participants in the ATNR, RIP, STNR, BBH, TTA, TP, PJS, SM and IC subtests. Gender

differences could be found in the performance of participants in the ET, TLM and J subtests, with girls faring better than boys in all three subtests.

Potgieter (2018) suggested that the performance of children in some clinical observations can be influenced by their environmental exposures and their level of skill. The researcher suggests that the ATNR, STNR, TTA, PJS, SM, EM and TLM were dependent on basic sensory motor functions whereas the BBH, TP, J and IC subtests could have been impacted by the environmental exposures and skill set of the child (Potgieter, 2018, p.219).

The upcoming chapter will give a final conclusion, outline the limitations and provide recommendations for future studies.

CHAPTER 6

CONCLUSIONS & RECOMMENDATIONS

6.1. INTRODUCTION

In Chapter 5, the measurable and observable results were discussed and results were compared and argued against relevant literature sources. In this chapter the researcher will reflect on attainment of the research objectives. This will be followed by a discussion of the limitations of the study and suggestions for future research.

6.2. CONCLUSIONS

The final conclusions of the study aim to answer the researcher objectives of the study. The objectives will be revisited against the results of the study.

6.2.1. Conclusion to Objective 1

Objective 1: To describe the measurable characteristics of five-year-old South African children in eleven subtests of the revised Clinical Observations by SAISI.

6.2.1.1. Grade Score Allocation

Participants obtained a grade score of 4-5 in just over half of the subtests, indicating that the Bilateral Ball Hitting (BBH), Tactile Perception (TP), Proximal Joint Stability (PJS), Eye Tracking (ET), Tongue and Lip Movements (TLM) and Jumping (J) subtests are realistic expectations of the five-year-old child, and that difficulty completing these subtests may be indicators of atypical function in the five-year-old child. In the remainder of subtests participants obtained a grade score of 1-3, as depicted in figure 6.1.

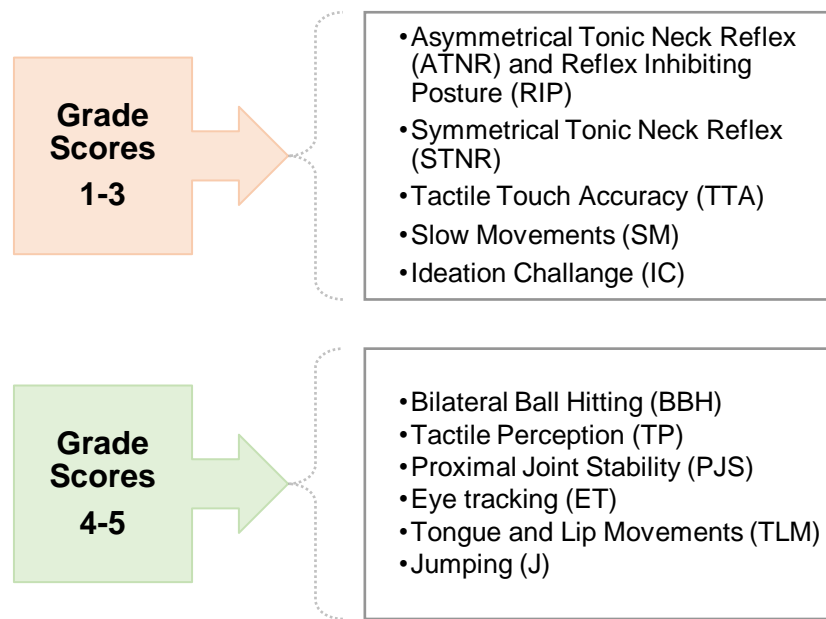


Figure 6. 1 Grade scorings most frequently obtained in the 11 subtests of the Revised Clinical Observations

The researcher reflects that her expectations of the five-year-old child were above their skill set and hypothesises that this may be why participants obtained a Grade score of 1-3 in the TTA, SM and IC subtests. The TTA and IC have furthermore never been piloted to obtain performance expectations, and the researcher is thus the first person to describe what the age expectations for this subtest could be. In addition, pilot study data may have influenced the researcher's perception of realistic expectations if the eight pilot study participants happened to perform better than most five-year-old children in a particular subtest.

The grade scoring was developed independent of parameters present as per recommendation of Potgieter (2018, p.230). This was to ensure that observable and measurable results remained separate from one another and to prevent difficulty interpreting results.

The researcher found that majority of participants obtained a lower grade scores for their performance of the tonic neck reflexes (ATNR, RIP and STNR). These results are congruent with Potgieter (2018, p.22). The researcher

echoes Potgieter's (2018, p.22) concern about the functional implication of these reflexes on the five-year-old child and highlight the need to investigate this phenomenon in future studies.

6.2.1.1. Results for Quantitative Data

The quantitative results for the TTA, TP and SM subtests were consistent with tests of motor proficiency such as the Movement ABC and the Clinical Observations (SAISI, 2005).

The degree of elbow flexion for the ATNR subtest was not consistent with literature. There are discrepancies in literature regarding which degree of elbow flexion indicates abnormality in the five-year-old child. Although the researcher obtained a similar upper quintile score for elbow flexion to Potgieter (2018, p.115), the lower quintile was far less than that recorded in her study. The researcher emphasises that caution be taken when recording the results of the ATNR subtest. The researcher highlights the importance of using a range of subtests to determine the presence of the ATNR such as the RIP and Schilder's arm extension subtests, in addition to the ATNR subtest.

The quantifiable results for the IC subtest was not consistent with the age expectations of the five-year-old child in the Test of Ideational Praxis (TIP). In the TIP a shoelace was used in the ideation task whereas in the IC a facecloth was used. The researcher anticipates that because a different object was used to the TIP it can be expected that results would differ.

The median scores, upper quintiles and lower quintiles are useful indicators which practitioners can use in the scoring of the ATNR, RIP, TTA, TP, SM, LM and IC subtests. To the researcher's knowledge this is the first pilot of some of these subtest and results can be helpful for the continued development of the Revised Clinical Observations (RCOs) by SAISI going forward.

6.2.2. Conclusion to Objective 2

To describe the observable characteristics of five-year-old South African children in eleven subtests of the revised Clinical Observations by SAISI.

The observable characteristics for each subtest were described in detail. Performance indicators were separated into Should Have (SH) and Should Not Have (SNH) parameters. SH parameters were indicators of function whereas SNH parameters were indicators of dysfunction.

The researcher categorised the prevalence of performance indicators for each subtest. Some SNH parameters were rarely present although the researcher anticipated that many of the SNH parameters would be typical for the five-year-old child. The researcher emphasises that therapists need to ensure that they consult literature when determining typical behaviour and continuous research is fundamental for evidence-based practice in the scope of Ayres Sensory Integration (ASI®).

Performance indicators *often present* were seen in more than 75% of participants. It is rational to anticipate that observations in this bracket should be typically observed in the five-year-old child.

6.2.3 Conclusion to Objective 3

To compare differences between the performance of five-year-old South African girls and boys on their performance on eleven subtests of the revised Clinical Observations by SAISI.

The results indicate that no statistically significant differences in the grade scoring of participants was evident in majority of the subtests. It is therefore reasonable to expect similar performance indicators for both genders on most of the subtests included in this study, in five-year-old children.

Statistically significant differences were found for the performance of participants in ET (visual pursuits and quick localisation), TLM (Blow up cheeks face) and J (all components) subtests. Girls were more likely to obtain higher grade scores in comparison to boys. These results need to be considered when scoring boys and girls in these subtests, to prevent inaccurate identification of sensory-motor impairment in boys.

6.3. CONTRIBUTION TO EXISTING KNOWLEDGE

A comprehensive literature study has identified concerns about the current COs by SAISI (2005). The norms have been developed outside of South Africa and are out of date. Observations also do not delineate between atypical and typical behaviour. The results are directed at growing the current body on the COs.

This study can make a contribution to the field of occupational therapy on the following tiers:

6.3.1. Expansion of Literature

This study has provided relevant developmental indicators for typical behaviour of five-year-old children in 11 subtests of the RCOs. Whilst this study is only on a small scale, it can contribute to the end goal of a COs supported by a strong evidence base.

This study in conjunction with Potgieter (2018) indicate that majority of five-year-old children situated in the Free State and the Eastern Cape present with seemingly active asymmetrical tonic neck reflexes. This poses the question: what is the functional implication of the presence of these reflexes on five-year-old children and how can they influence academic performance? In addition, it poses the question whether the method in which we administer the ATNR subtest is valid?

Whilst not entirely the scope of this study, the high prevalence of the ATNR and STNR in participants may indicate that children with sensory integration

dysfunction (SID) are being overlooked. Literature further highlights that there is an inequality between private and public healthcare, whereby children are more likely to receive formal ASI[®] assessment and intervention in the private sector. This study therefore emphasises the ethical obligation of SAn therapists to endorse and develop more accessible assessments and intervention strategies. Efforts have been made by the South African Institute for Sensory Integration (SAISI) by assisting in the data collection of the EASI. The researcher hopes that future generations can identify means in which ASI[®] intervention can be provided to all SAn children.

6.3.2. Implication for future use of assessment

The researcher has better delineated between atypical and typical behaviour for five-year-old children. It the researcher's hope that her results can be used in conjunction with Potgieter (2018) to provide performance indicators for a collective 19 subtests of the RCOs. This may better assist therapists in resource constrained areas to accurately identify atypical behaviour for five-year-old children using the RCOs. Accurate identification of performance difficulties could potentially assist with early identification of at-risk children, before they enter the formal schooling system.

Whilst the foundations of this study were rooted in ASI[®] assessment, some subtests investigate constructs of neuro-developmental therapy (NDT). Results can thereby potentially also be useful for therapists working in the field of NDT.

This study indicated that some developmental differences exist between boys and girls when performing items of the RCOs, with girls out-performing boys in three out of the 11 items. It can thereby be concluded that for majority of the subtests investigated, gender differences do not be considered when determining performance.

6.3.3. The continued development of the revised clinical observations (RCOs)

The researcher is optimistic that her results can contribute to the revision of the Clinical Observations (RCOs). The researcher has assisted ASI® specialists to refine the administration and equipment needed for each of the newly added subtests to the RCOs. The researcher hopes that her effort has increased the feasibility of using these subtests by eliminating some factors which hinder practical and productive application in practice. The researcher considered the following factors to ethically implement the newly added subtest:

- Majority of equipment is inexpensive and affordable to practitioners in both the public and private sector, although the researcher recommends that a study must be conducted to determine the feasibility for use of the RCOs in the public and private sector.
- Where possible equipment is derived from materials which can be found from home or recycled such as shoe boxes or stockings
- Subtests are efficient and take no longer than 5-10 minutes

Whilst the following is helpful, the researcher encourages continuous critical appraisal of these subtests to ensure their relevance and accuracy in the paediatric setting.

6.4. RECOMMENDATIONS

6.4.1 Based on the conclusion the following recommendations are made:

The researcher reflects there is a delay in the transference of research results into practice. Kirstenson, Nymann and Konradson (2016, p.1) state that this phenomenon is known as the research-evidence gap or the knowing doing gap (Pfeffer and Sutton, 2000; Real & Poole, 2004, Lilienfeld, Ritschel, Lynn, Brown, Cautin and Latzman, 2013, p.386). To narrow the gap between

transference of research into practical application, for this study, the researcher recommends the following:

- The researcher intended to present her results at the SAISI annual general meeting (AGM), which was set to take place in June 2020. Due to the COVID 19 pandemic the research workshops were suspended. If given the opportunity it is recommended that results be presented at national and international congresses to distribute the results so that they are available for the greater ASI® community.
- The results should be published in accredited journals with an open access such as the South African Journal for Occupational Therapy. Allowing open access will ensure that therapists from all socioeconomic backgrounds are provided with results.
- The results should be submitted to SAISI, who may find value in including the results in upcoming course material, for the training of both novice and experienced ASI® therapists. SAISI could also include the results in the new format of the COs, which is still intended to be published.
- Results can be submitted to universities which include the COs in their undergraduate training program, for inclusion in coursework. This may better facilitate students to identify patterns of atypical behaviour.

6.4.2. Recommendations for Future Research

In the field of ASI®®, there remains a need for research to ensure the continuous development of the framework, so that it may have a strong evidence base. This is to promote evidence-based practice in the field of occupational therapy, but also to obtain mutual respect from both the medical and wider South African (SAn) community, regarding the benefits of ASI® intervention.

The researcher suggests the following topics should be explored in future studies:

- Research on children five-years six months to five years eleven months on the remaining subtests of the Clinical Observations (COs) (2005) and the Clinical Observations of Gross Motor Items (2004)
- Research determining which subtests should be included in the RCOs through peer review and systemic needs-based studies, which consider therapists who work in a lower socio-economic setting.
- Research linking the observations in each item to patterns of Sensory Integration Dysfunction.
- Research determining the functional implications of active primitive reflexes in the five-year-old child, specifically in the South African context.
- An investigation of the RCOs subset in provinces other than the Free State and the Eastern Cape, to give an in-depth picture of typical development, on a national level.
- An investigation of the performance of children younger and older than five-years of age (roughly between three and eight years) on subtests of the RCOs.
- Research investigating whether or not SAn therapists prefer to use the COs in isolation or in conjunction with available formal ASI® assessments. It is important to determine this so that we can determine whether or not SAn therapists are performing reliable assessment in the field of ASI®. The use of non-standardised assessment in isolation may afford error in identifying SID and directly impact the accuracy of intervention.
- The researcher recommends that in future studies researchers should ensure newly added Subtests of the RCOs have been piloted and that administrative procedures and equipment required for implementation in practice are clearly delineated to prevent changes in the measurement instrument and to prevent unplanned implications on budget and time schedules.
- Research aimed at developing CO's manuals which are available in native SAn Languages such as isiXhosa and Afrikaans. The researcher has considered that most SAn universities now train therapists in

English. This point is however not focused on therapists, but rather at the relay of instructions to children in their native language. The population distribution of this study identified that a large portion of participants are in fact isiXhosa speaking, instructions not delivered in their language may thus afford children to make mistakes which provides an inaccurate reflection of their performance in the COs. The researcher further considers, that the inclusion of interpreters in paediatric assessment may need to be considered because it is evident that for many SAn children English is not their preferred language. Employment of interpreters can provide job creation, this is especially relevant in the SAn context due to the high rate of unemployment, which has been further exasperated by the COVID-19 pandemic.

6.4. LIMITATIONS OF STUDY

The researcher recognises limitations to the study and advises the reader to be cognisant of these limitations when interpreting the study results. The study limitations are as follows:

- The study sample consisted of 104 typically developing children due to financial constraints, even with external funding. In addition, the researcher only had four months to complete the study because this was the only period of time the researcher's work allowed a period of leave without penalty.
- The study sample consisted of children in the Buffalo City Metro only and for this reason it cannot be generalised on a national level.
- The study only included children attending public schools and is thus not inclusive of children attending private schools.
- No prior research has been completed on the newly added subtests of the RCOs and for this reason a specific comparison could not be drawn to determine the relevance of results in these subtests, in relation to literature.
- According to the standards by SAISI, the researcher was not ASI® qualified during the phase of data collection. The researcher did

however begin her qualifying procedures and was committed to the completion of all four courses. This is identified as a limitation as an argument can be made that the researcher did not have the correct qualifications to obtain reliable results. The researcher did however ensure that she obtained expert mentorship from three experienced ASI® to try and ensure that this limitation had little to no impact on this study.

- The COs are a set of non-standardised assessments, they are thereby open to the subjective interpretation of the therapist. The researcher was the only person responsible for administration procedures and the interpretation of results. Inter-rater reliability of the COs has not been established and the validity and reliability of the assessment is unknown. Investigation into the psychometric properties of the COs, albeit a non-standardised assessment, may be of value.

6.5. CLOSURE

A quantitative observational, descriptive and analytical, cross-sectional study design allowed the researcher to address the aims and objectives of this study. The researcher was able to provide age trends which described how children perform in items previously included in the COs (SAISI, 2005) and items which have newly been added to the RCOs (SAISI, 2016).

Measurable characteristics provided quantitative data which described typical performance of five-year-old children in 11 subtests of the RCOs. Observable characteristics were separated into SH and SNH parameters and these observations were categorised according to prevalence in the study sample, this classification method was adopted from Potgieter (2018, p.66-67). The results of these performance indicators allow the therapist to differentiate between atypical and typical performance observations when conducting the RCOs.

This study provided a platform for the exploration of items of the RCOs and is only a stepping stone for future studies to build onto. The researcher wishes

to express the importance of continued research of the RCOs on a national level and studies which are inclusive of children of different ages.

In conclusion this study proves that current norms in the COs which determine performance of five-year-old children remain valid, with the exception of the ATNR and STNR subtests. This study furthermore makes it clear that performance differences between boys and girls in the COs are unlikely for most of the subtests.

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Appendix 1: Description of Should Have (SH) & Should Not Have (SNH) Parameters

CLARIFICATION OF SHOULD PARAMETERS, SHOULD NOT HAVE PARAMETERS & GENERAL OBSERVATIONS			
1.1. ATNR			
SN Parameter	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Flexion of Elbow $x > 25^\circ$	When the child's head position is altered by the examiner their opposite elbow flexes less than 25° .	Flexion of elbow $x > 25^\circ$	When the child's head position is altered by the examiner their opposite elbow flexes more than 25°
No changes in Joint Position	When the child's head position is altered by the examiner their opposite elbow does not change flex (no change in position at the elbow is noted).	Unable to maintain head position	When the child's position is altered by the examiner, they are unable to maintain their head against their shoulder, when the examiner asks them to do so.
Maintains Head Position	When the examiner alters the child's head position, the child is able to maintain their head against their shoulder, when the examiner asks them to do so.	Extension of leg on face side	The child extends their leg on the side that their head is turned.
		Moves hips over to the side	The child responds by altering the position of their hips when the position of the head is changed.
		Loses Balance	When the child's position is altered by the examiner, they struggle to maintain the position. This can be characterised by falling out of the position
		Body Swaying	When the child is in the four-point kneeling position their body moves from side to side.
		Associative reaction	The child makes use of an associative reaction, for example: <ul style="list-style-type: none"> • Mouth opening • Pursing of lips
ATNR, General Observations:			
Observation	Clarifying and defining concept		
Locks or fixates Elbows	In the four-point kneeling position. The child's elbows go into hyperextension, thus causing them to lock their elbows.		
Resistance to head turning	The child resists movement of their head to the left or the right side of their body.		

1.2. Reflex Inhibiting Position (RIP)			
SN Parameter	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Maintains head position	When the examiner alters the child's head position, the child is able to maintain their head against their shoulder, when the examiner asks them to do so.	Body swaying	When the child is in the four-point kneeling position their body moves from side to side.
Keeps leg straight	The child can maintain the leg opposite to their head and arm position straight. Thereby not flexing their knee or hip.	Unable to maintain head position	When the child's position is altered by the examiner, they are unable to maintain their head against their shoulder, when the examiner asks them to do so
Keeps back straight	The child maintains their back in a neutral position, without curving or rounding their spine.	Unable to maintain arm position	The child is unable to maintain their arm position on the same side their head is rotated. This may be due to the child losing balance and thereby performing protective extension.
Leg in line with hip	The child maintains their leg in line with their hip. Their leg does not sway left or right.	Unable to maintain leg extended	The child is unable to maintain the leg straight on the opposite side that their head is rotated. This can be marked by knee and hip flexion.
		Curves back	The child's back makes a prominent c curve or curves into lordosis.
		Retracts chin into shoulder	The child fixates their chin against their shoulder to maintain their balance and the RIP position.
		Opens shoulders and turns body	The child turns and opens their body towards the directions of that their head is rotated.
		Loses balance	When the child's position is altered by the examiner, they struggle to maintain the position. This can be characterised by falling out of the position
RIP, General Observations:			
Observation		Clarifying and defining concept	
Locks or fixates Elbows		In the four-point kneeling position. The child's elbows go into hyperextension, thus causing them to lock their elbows.	
Resistance to head turning		The child resists movement of their head to the left or the right side of their body.	

2. STNR			
SN Parameter	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
No changes in joint position	The child does not change the position of their head, back or elbows when the examiner: 1) Flexes their head 2) Extends their head	Unable to maintain head position	When the child's position is altered by the examiner, they are unable to maintain their head in either: 1) Flexion 2) Extension.

	Elbow flexion	When the child's head is flexed by the examiner, they respond by flexing their elbows.
	Rounded back	When the child's head is flexed by the examiner, they round their back in a C curve.
	Posterior pelvic tilt	When the child's head is flexed by the examiner, they respond by rotating their pelvis backwards/posteriorly
	Cannot hold position when head is in flexion	The child cannot maintain balance when their head is flexed by the examiner.
	Hyperextension of elbows	When the child's head is extended, the child's elbows move beyond the normal range of elbow extension
	Lordosis	When the child's head is extended, the child presents with an excessive inward curve of their spine
	Anterior Pelvic Tilt	When the child's head is extended their hips rotate forward/anteriorly
	Cannot hold position when head is in extension	The child cannot maintain balance when their head is extended by the examiner.
STNR, General Observations		
Observation	Clarifying and defining concept	
Resistance to head turning	The child resists head flexion and head extension when the examiner attempts to move their head.	
Resistance to head turning	The child resists movement of their head to the left or the right side of their body.	

3. Bilateral Ball Hitting			
SN Parameter	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Makes use of midline crossing	The child is able to hit the ball, even when it crosses their midline. The child does not lift their bum at any point during the subtest.	Shifts bum and body to bring ball back into midline	The child shifts their bum and body so that when they ball changes direction, they stay in line with the ball.
Bilateral Ball Hitting, General Observations			
Observation	Clarifying and defining concept		
Does not let go of foil roll	The child holds the foil roll with both of their hands		
Elbow flexion and extension	The child is able to dissociate their shoulders and elbows. They are thus able to make use of elbow flexion and extension when hitting the ball.		
Smooth arm movement	The child produces a coordinated and graceful movement.		
Able to follow instructions	The child is able to easily follow the instructions given to them.		
Avoidance reaction to ball	The child moves backwards when the ball moves towards them and may respond by pulling away, pulling their face and or excessive blinking.		

Let's go of foil roll	The child tries to hold the foil roll with one hand or has difficulty holding the foil roll with both hands.
Maintains elbows extended	The child maintains extended elbows when hitting the ball. They are unable to flex and extend their elbows when hitting the ball.
Rigid arm movements	The child's movements of their arms and shoulders appear to be jerky and poorly controlled.
Unable to follow instructions/ requires instructions to be repeated	The child has difficulty listening to and following instructions.
Associative reaction of mouth	The child makes use of an associative reaction, for example: <ul style="list-style-type: none"> • Mouth opening • Pursing of lips

4. Tactile Touch Accuracy			
SN Parameter	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Able to identify location	The child is able to point to the correct body part, without visual stimuli and only with tactile input.	Inaccurate pointing to body part	The child is unable to accurately point to the correct body part. The child may also try and make use of visual stimuli and not only rely on tactile input.
		Delayed response to touch	The child takes 5 seconds or more before they respond to the tactile input.
		Uses verbal prompts to try and identify body part	The child uses phrases like, " it is over there" or "it is by your finger", but avoids pointing where they think the examiner is positioned.

Tactile Touch Accuracy, General Observations:	
Observation	Clarifying and defining concept
Rubs or scratches on the location where the examiner touches	The child responds to tactile input provided by the examiner by scratching or rubbing the area. This may be a possible sign of tactile defensive behaviour.
Decreased eye contact	The child does not appear to make contact with the examiner or avoids eye contact.
Negative emotional response	The child responds with a negative emotional response such as crying or hitting.
Refusal to participate in activity	The child appears not to want to participate in the activity.

Inattentive behaviour	The child demonstrates one or more of the following behaviour(s): <ul style="list-style-type: none"> • Difficulty sustaining attention in task • Does not seem to listen when spoken to directly • Does not follow instructions • Easily distracted by external stimuli
Hyperactive & Impulsive behaviour	The child presents with one or more of the following behaviour(s): <ul style="list-style-type: none"> • Fidgets • Struggles to maintain a seated position • Tries to get up and run or climb • Talks excessively

5. Tactile Perception			
SH Parameters	Clarifying and defining concept	SNH Parameters	Clarifying and defining concepts
Listens and follows instructions	The child pays active attention which can be noted if the child: <ul style="list-style-type: none"> • Makes eye contact • Asks questions • Nods their head • The child follows the instructions given by the examiner accurately. 	Attempts to look inside the box	The child tries to make use of visual stimuli in order to identify the object.
Able to complete the entire activity	The child is able to comply and complete the activity, without presenting with explosive emotions and blatant refusal to complete the activity.	Difficulty finding object in box	The child has difficulty finding the object in the box. The child may become frustrated and ask for assistance.
		Tries to redo initial try/compensates for mistakes	The child tries to redo their initial attempt.

Tactile Perception, General Observations:	
Observation	Clarifying and defining concept
Resistant to put hand(s) in box	The child may be unsure and not willing to put their hand(s) in the box.
Does not want to maintain hand(s) in box	The child tries to take their hand(s) out of the box and is resistant to put their hand(s) back in the box.
Shy to interact with activity	The child is avoidant of the activity and appears unsure whether they should engage in the activity.
Appears confused by the activity	Once instructions have been explained the child still appears unsure of themselves.
Explosive emotions or anxiety	<ul style="list-style-type: none"> • Appears unsure • Presents with explosive emotions e.g. becomes tearful, angry or irritable. • Physically inappropriate behaviour e.g. throws shoes. • Appear nervous: <ul style="list-style-type: none"> – Begins to sweat – Appears to avoid taking off shoes – Does not make eye contact
Refusal to complete activity	The child blatantly refuses to carry on with the activity.
Associative Reactions of Mouth	The child makes use of an associative reaction, for example: <ul style="list-style-type: none"> • Mouth opening • Pursing of lips
Decreased eye contact	The child does not appear to make contact with the examiner.
Inattentive behaviour (IA)	The child demonstrates one or more of the following behaviour(s): <ul style="list-style-type: none"> • Difficulty sustaining attention in task • Does not seem to listen when spoken to directly • Does not follow instructions • Easily distracted by external stimuli
Hyperactive and impulsive behaviour	The child presents with one or more of the following behaviour(s): <ul style="list-style-type: none"> • Fidgets • Struggles to maintain a seated position • Tries to get up and run or climb • Talks excessively

6. Proximal Joint Stability			
SH Parameters	Clarifying and defining concept	SNH Parameters	Clarifying and defining concept
No Change in Posture	The child is able to maintain their starting posture even when the examiner applies a force. This implies there is no change in the position of their hips or shoulders.	Joints move in direction of force	The child's joints move in the direction of the force that the examiner applies.
Maintains balance	The child is able to maintain their centre of gravity without falling over.	Fixation of upper limbs	The child contracts and fixates muscles of the upper arm
		Hyperextension of elbows	The child hyperextends their elbows. This may be due to low postural tone or lax ligaments.
		Elbow flexion	Unable to maintain elbows extended in response to the force applied by the examiner.
		Crossing of ankles	The child compensates by crossing their ankles
		Widens base of support	The child tries to improve their balance, by widening their base through placing their extremities further away from one another.
		Does not weight bear on all four limbs	The child may compensate by only weight bearing on stronger joints e.g. weight bearing on their dominant upper limb and hip.
		Loses balance	The child is unable to maintain his centre of gravity in the four-point kneeling position and loses his balance.
		Moves hips over to side	The child's hips move in same direction that the force is applied.
		Falls back onto haunches	The child falls onto their haunches in response to the force applied by the examiner.
		Lordosis	The child curves their back, in response to the force the examiner applies.
		Rounded Back	The child rounds their C curve of their back.

7. Slow movements			
SH Parameters	Clarifying and defining concept	SNH Parameters	Clarifying and defining concept
Well controlled movement	The child is able to complete the movement by stabilising shoulder movements and not allowing their arms to drop.	Some left right difference	At the age of five it is normal to have some left right difference when completing slow movements. Normally the hand that returns first is the weaker hand.
Smooth and fluid movement	The child produces a coordinated and graceful movement.	Shoulders dropping	The child is unable to <i>maintain</i> their shoulders at 90° abduction. Their shoulders thus drop to less than 90° abduction.
Full elbow extension	The child is able to completely extend their elbows to 180° in the slow movements sequence.	Rigid arm movements	The child's movements of their arms and shoulders appear to be jerky and poorly controlled.
Shoulder abduction to 90°	The child is able to abduct their shoulders to 90°.	Did not fully extend elbows	The child extends his elbows in the extension phase of the movement less than 180°.
		Did not fully abduct shoulders to 90°	The child is unable to abduct their shoulders to 90°. The child abducts their shoulders to an angle less than 90°.
		Visually monitors movement	The child relies of visual input to grade and coordinate slow movements of their shoulders and elbows.
Slow Movements, General Observations:			
Observation		Clarifying and defining concept	
Associated movement of mouth		The child makes use of an associative reaction, for example: <ul style="list-style-type: none"> • Mouth opening • Pursing of lips 	
Unable to maintain feet flat on floor		The child lifts their feet from the floor at any point in the sequence.	
Crossing of ankles		The child compensates by crossing their ankles. This is an incorrect postural habit.	
Widens base of support		The child compensates by widening their base of support in order to improve their static and dynamic sitting balance. This could be due to poor activation of core muscles e.g. rectus abdominis and back stabilising muscles. The child could do so by: <ul style="list-style-type: none"> • Upright W sitting. Knees inverted, thighs touching and feet inverted. • Hips abducted, knees far apart and feet everted. 	
Slouched seated posture		The child sits with: <ul style="list-style-type: none"> • Shoulder protracted • Chin poke • Slumped back in seat (pronounced Cervical Curve) 	

8. Eye Tracking			
SH Parameters	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Visual fixation on object	The child is able to maintain eye contact and focus on the object. Or In the midline crossing section, the child is able to perform midline crossing	Difficulty fixating on object	The child struggles to maintain eye contact and focus with the object.
Smooth coordinated eye movements	The eye movements are continuous, fluid and without jerks.	Rigid movement	Eye movements are not smooth and appear to be delayed.
Moves eyes independently from head	The Child's eyes are able to move separately from the child's head. Thus, they are able to dissociate head and eye movements	Loses focus when crossing the midline	The child is unable to maintain eye contact and focus with the object when crossing the midline. The child may present with a slight hesitation or jerk of their eyes when crossing the midline.
		Makes use of head movements	The child is unable to dissociate head and eye movements. The child is thus unable to move their eyes separately from their head.

Eye Movements, General Observations	
Observation	Clarifying and defining concept
Associative reaction of mouth	The child makes use of an associative reaction, for example: <ul style="list-style-type: none"> • Mouth opening • Pursing of lips
Slouches in seat	The child sits with: <ul style="list-style-type: none"> • Shoulders protracted • Chin poke • Slumped back in seat (pronounced rounded Cervical Curve)
Eyes water	The child's eyes tear.
Excessive Blinking	The child blinks their eyes excessively, which influences their ability to maintain focus on the object.

9.1. Tongue movements			
SH Parameters	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Accurately completes movement	Tongue movement is planned and coordinated. The child can maintain tongue out of mouth, for the duration of a given tongue movement. The movement is accurately replicated.	Cannot Complete Movement	The child is unable to mirror the tongue movement demonstrated by the examiner.

	Associated movement of head	The child is unable to dissociate tongue and head movements. The child's tongue and head thus move in unison.
	Associated movement of jaw	The child is unable to dissociate tongue and jaw movements.
	Jerky movement	Tongue movement is not smooth and appears to be delayed.
	Tongue jerks in corner of mouth	A quick rigid movement when the tongue reaches the corner of the child's mouth.
	Reduced speed of motions	The child performs the movements slower than the speed demonstrated by the examiner.
	Poor mouth closure	The child struggles to keep their mouth closed. This may result in mouth breathing.
General Observations, Tongue Movements		
Observation	Clarifying and defining concept	
Slouches seat	The child sits with: <ul style="list-style-type: none"> • Shoulder protracted • Chin poke • Slumped back in seat (pronounced Cervical Curve) 	
Involuntary tongue protrusion	The child may present with an open mouth and a protruding tongue. The child may present with mouth breathing or poor speech.	
Dribbling	The child presents with poor oral motor control which results in saliva dripping or trickling from their mouth.	
Difficulty sustaining tongue protrusion	Inability to maintain tongue out of mouth, for the duration of a given tongue movement.	
Pursing of lip	Tightly presses lips together, which causes lips to form a rounded shape.	

9.2. Lip & Face Movements			
SH Parameters	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Able to assume facial expression	The child is able to perform the lip movement demonstrated by the examiner	Unable to assume facial expression	Unable to assume the lip movement demonstrated by the examiner.
Able to maintain facial expression for a duration of 10 seconds	The child is able to maintain the facial expression demonstrated by the examiner for a duration of 10 seconds.	Unable to maintain facial expression for at least 10 seconds	The child is unable to maintain the lip movement demonstrated by the examiner for a duration of 10 seconds.
		Drooling/ Dribbling	Same as 9.1.

		Unable to push lips forward	The child is unable to push their lips forward in the kissing face, lip movement.
		Air escapes from lips	The child is unable to contain air in their cheeks in the, blow up cheeks, lip movement.

10. Jumping Sequence			
SH Parameters	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Jumps with feet together	Able to keep feet together when jumping.	Unable to maintain feet together (5cm allowance)	Unable to jump with feet together, a 5cm allowance is allowed.
Follows sequence	The child is able to copy the jumping or the jump hop sequence accurately.	Unable to accurately execute sequence	The child performs an inaccurate sequence.
Continuous movement in sequence	The child is able to complete the sequence rhytPically without stopping.	Maintains legs stiff or in extension	The child maintains stiff, extended knees and hips in the jumping sequences.
Controlled stop	The child is able to stop the sequence in a coordinated manner.	Starts and stops the sequence	The child does not complete the sequence continuously and rhytPically.
		Poor rhytP	The child performs the jumping sequence in a jerky or rigid manner.
		Cannot control stop	The child loses their balance when stopping the sequence.
		Abducts arms more than 15°	The child abducts their shoulders more than 15°.
		Flexes elbows	The child flexes and abducts their elbows against their sides.
General Observations, Jumping Sequence			
Observation	Clarifying and defining concept		
Poorly graded landing of LLs	Difficulty controlling to force to exert on the LLs.		
Finishes beyond or behind 4m marker.	The child struggle to control the movement by completing the sequence for the 4m distance. The child may complete the sequence before the 4m marker or beyond the 4m marker.		
Asks or requires the examiner to repeat demonstration of sequence	Inattentive behaviour. The child is unable to relay instructions after the first time the examiner gives instructions.		
Associative reactions of mouth	The child makes use of an associative reaction, for example: <ul style="list-style-type: none"> • Mouth opening • Pursing of lips 		
Fixates arms	The child fixates their arms next to their body.		
Criss Crosses legs	In the open and closed legs section the child is unable to perform the jumping section with their feet together and rather criss crosses their legs.		

11. Ideation Challenge			
SH Parameters	Clarifying and defining concept	SNH Parameter	Clarifying and defining concept
Wash Able	Pretends to use the wash cloth to wash themselves.	Explosive Emotions	The child presents with anxiety or uncertainty in the activity.
Clean Able	Pretends to clean a surface such as a floor or a table with the wash cloth.	Shy to interact with washcloth	The child is reserved and unsure what to do with the washcloth.
Put on floor able	The child puts the cloth flat on the floor.	Inattentive behaviour	The child demonstrates the following behaviour: <ul style="list-style-type: none"> • Difficulty sustaining attention in task • Does not seem to listen when spoken to directly • Does not follow instructions • Easily distracted by external stimuli
Stand on Able	The child puts the cloth on the floor and then proceeds to stand on the cloth.	Uses language to describe the activity instead of demonstrating actions	The child uses language to describe what to do with the wash cloth rather than demonstrating actions.
Pendulum swing Able	The child holds on a corner of the cloth and swings it from side to side	Tries to incorporate other objects	The child attempts to incorporate other objects in the activity such as other toys or stationery that may be in the room.
Wring/Twist Able	The child holds the cloth between both hands and wrings it as if to wring water out of the cloth.		
Pass around body Able	The child bilaterally passes the cloth around their body, from one side to the other.		
Fan Able	The child holds the cloth between both hands and moves it up in down and appears to fan the examiner.		
Spin in circle Able	The child holds the cloth at one corner and spins with the cloth in a circle.		
Bite Able	Bites the wash cloth.		
Scrunch Able	Scrunches the wash cloth with their fist.		
Throw Able	The child throws the wash cloth.		
Twirl Able	The child twirls the wash cloth with their fingers.		
Wrap around Able	The child wraps the wash cloth around their body.		
Whip Able	The child moves the wash cloth in a whipping motion.		
Stretch out between two hands Able	The child holds the wash cloth between both hands and stretches it parallel to their body.		

Hold against body Able	The child holds the wash cloth against their body.	
Fold Able	The child folds the cloth in half or in quarters.	
Jump over or on Able	The child places the wash cloth on the ground and jumps over it.	
Other _____ Able, Specify:	Any other action not yet mentioned. It should be specified.	

Appendix 2: Phase 1- Measurement Instrument (Pre-Pilot Study)

Adapted Version of The SAISI (2005) Clinical Observations (Adapted from Ayres, A.J.) And Revised Clinical Observation (SAISI, 2016)

Number of Child:			
DOB:	DD	MM	YY
Gender:	F		M
Date of assessment:	DD	MM	YY
Gender of Child:	Female		Male

	1	2	3	4	5
Please note: The following scoring system will be used as adapted from the revised clinical observations	Unable to perform the subtest	Tries to perform the subtest, but can only perform parts of the task	Performs the subtest with poor control and integration of movements	Good performance of subtest, the slight difficulty experienced with the integration of movements	Excellent execution of subtest. Performs subtest with ease and easily integrates movements

						PERFORMANCE CHARACTERISTICS	
SUBTEST	SCORING AND COMMENTS					OBSERVABLE CHARACTERISTICS	MEASURABLE CHARACTERISTICS
1) Asymmetrical Tonic Neck Reflex (ATNR)							
<ul style="list-style-type: none"> • Left elbow: _____ (degree of flexion) • Right elbow: _____ (degree of flexion) 	1	2	3	4	5	<input type="checkbox"/> No changes in joint position at the movement of the child's head <input type="checkbox"/> Reflex present in a reflex inhibiting position <input type="checkbox"/> Elbow flexion in R / L arm when head moved to the contralateral side <input type="checkbox"/> Difficulty maintaining balance e.g. body sway <input type="checkbox"/> Resistance to head turning <input type="checkbox"/> Associated reaction e.g. opening of the mouth <input type="checkbox"/> Hyperactive behaviour <input type="checkbox"/> Inattentive behavior	Degrees left arm: <input type="checkbox"/> More than 25° Flexion <input type="checkbox"/> 25° Flexion <input type="checkbox"/> Less than 25° Flexion Degrees right arm: <input type="checkbox"/> More than 25° Flexion <input type="checkbox"/> 25° Flexion <input type="checkbox"/> Less than 25° Flexion
	<i>Comments:</i>						

2) Symmetrical Tonic Neck Reflex (STNR)

	1	2	3	4	5		
	<p><i>Comments:</i></p>					<ul style="list-style-type: none"> <input type="checkbox"/> No changes in joint position at the movement of the child's head <input type="checkbox"/> Reflex present in a reflex inhibiting position <input type="checkbox"/> Resistance to head turning <input type="checkbox"/> Flexion of elbows when head extends <input type="checkbox"/> Extension of elbows when head flexes <input type="checkbox"/> Anterior Pelvic tilt <input type="checkbox"/> Curving of the back <input type="checkbox"/> Posterior Pelvic tilt <input type="checkbox"/> Arching of the back (Lordosis) <input type="checkbox"/> Locks elbows (low tone) <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Hyperactive behaviour 	

3) Slow Movements

	1	2	3	4	5		
<ul style="list-style-type: none"> Completed twice: Once with the child mirroring the examiner and a second time in which the child does the movement with the examiner <p>Number of seconds taken to complete the movement when the child mirrors the movement: _____</p>	<p><i>Comments:</i></p>					<ul style="list-style-type: none"> <input type="checkbox"/> Arms dropping or slumping- indicative of poor co-contraction <input type="checkbox"/> Right arm returns first <input type="checkbox"/> Left-arm returns first <input type="checkbox"/> Slumped seated posture <input type="checkbox"/> Incoordination <input type="checkbox"/> Associated reaction e.g. mouth opening or pursing of lips <input type="checkbox"/> Incoordination <input type="checkbox"/> Hyperactive behaviour <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Non-symmetrical movement <input type="checkbox"/> Rigid arm movements 	<ul style="list-style-type: none"> <input type="checkbox"/> Less than 10 seconds <input type="checkbox"/> 10 seconds <input type="checkbox"/> More than 10 seconds

4) Bilateral Ball Hitting

	1	2	3	4	5		
<ul style="list-style-type: none"> • Hit ball accurately and directly in front: _____ times Hit ball at 45° left, accurately: _____ times • Hit ball at 45° right, accurately: _____ times • Hit ball at 90° left, accurately: _____ times • Hit ball at 90° right, accurately: _____ times • 	<p><i>Comments:</i></p>					<input type="checkbox"/> Incoordination <input type="checkbox"/> Presence of trunk rotation <input type="checkbox"/> The absence of trunk rotation <input type="checkbox"/> No dissociation of the trunk and upper limbs <input type="checkbox"/> Slumped seated posture <input type="checkbox"/> Avoidance of midline crossing <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Hyperactive behaviour	<input type="checkbox"/> Directly in front: Hit ball x<3 <input type="checkbox"/> Directly in front: Hit ball x=3 <input type="checkbox"/> Directly in front Hit ball x>3 <input type="checkbox"/> Hit ball at 45° left x<3 <input type="checkbox"/> Hit ball at 45° left x=3 <input type="checkbox"/> Hit ball at 45° left x>3 <input type="checkbox"/> Hit ball at 45° right x<3 <input type="checkbox"/> Hit ball at 45° right x=3 <input type="checkbox"/> Hit ball at 45° right x>3 <input type="checkbox"/> Hit ball at 90° left x<3 <input type="checkbox"/> Hit ball at 90° left x=3 <input type="checkbox"/> Hit ball at 90° left x>3 <input type="checkbox"/> Hit ball at 90° right x<3 <input type="checkbox"/> Hit ball at 90° right x=3 <input type="checkbox"/> Hit ball at 90° right x>3

5) Jumping Sequence

	1	2	3	4	5		
<ul style="list-style-type: none"> • Jump with two feet together three times consecutively • Number of times the child can jump with two feet together accurately: _____ 	<p><i>Comments:</i></p>					<ul style="list-style-type: none"> <input type="checkbox"/> Difficulty experience with the cognitive planning of action <input type="checkbox"/> Incoordination <input type="checkbox"/> Use of associative reactions e.g. opening of mouth or pursing of lips <input type="checkbox"/> Inability to make use of equilibrium reactions and readjust posture (clumsy behaviour) <input type="checkbox"/> Cannot land with both feet simultaneously <input type="checkbox"/> Developmental progression- forward jump with legs open and then closed <input type="checkbox"/> Cannot copy sequence correctly e.g. jump three times <input type="checkbox"/> Hyperactive behaviour 	<ul style="list-style-type: none"> <input type="checkbox"/> Jumps less than three times <input type="checkbox"/> Jumps three times <input type="checkbox"/> Jumps more than three times

6) Movement of limbs to contralateral side

<ul style="list-style-type: none"> • Passing of ball to the contralateral side • Number of times the child can pass the ball accurately: _____ 	1	2	3	4	5	<input type="checkbox"/> Avoidance midline crossing <input type="checkbox"/> Inability to maintain a static postural position <input type="checkbox"/> Leans against the therapist- indicative of a decrease in endurance to maintain posture <input type="checkbox"/> No dissociation of the trunk and upper limbs <input type="checkbox"/> Clumsy movement e.g. drops the ball <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Hyperactive behaviour	<input type="checkbox"/> Able to pass accurately more than three times <input type="checkbox"/> Able to pass accurately three times <input type="checkbox"/> Able to pass accurately more than three times
	<i>Comments:</i>						

7) Tactile Touch Accuracy

<ul style="list-style-type: none"> • Identification of 5 body parts • Number of body parts identified: _____ 	1	2	3	4	5	<input type="checkbox"/> Tactile defensive behaviour <input type="checkbox"/> Attempts to open eyes to provide sensory input to identify body parts <input type="checkbox"/> Poor emotional regulation e.g. irritability or crying <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Hyperactive behaviour (especially impulsive behaviour)	<input type="checkbox"/> Can identify less than 5 body parts <input type="checkbox"/> Can identify 5 body parts <input type="checkbox"/> Can identify more than 5 body parts
	<i>Comment s:</i>						

8) Tactile Perception

<ul style="list-style-type: none"> • Identified _____ objects without visual stimuli 	1	2	3	4	5	<input type="checkbox"/> Can quickly identify each object <input type="checkbox"/> Takes a long time to identify the objects <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Hyperactive behaviour (especially impulsive behaviour) <input type="checkbox"/> Tactile defensive behaviour	<input type="checkbox"/> Could not identify any objects <input type="checkbox"/> Could identify less than 5 objects <input type="checkbox"/> Could identify more than 5 objects <input type="checkbox"/> Could identify all (5) of the objects
	<i>Comments:</i>						

9) Proximal Joint Stability

	1	2	3	4	5		
<p><i>Positions to be assumed by the child:</i></p> <ol style="list-style-type: none"> 1. 4 Point Kneeling posture 2. Seated position, holding a 20cm ball 	<p><i>Comment s:</i></p>					<ul style="list-style-type: none"> <input type="checkbox"/> Crosses ankles in fourpoint kneeling <input type="checkbox"/> Fixation of shoulders (static balance) <input type="checkbox"/> Increase in the strength of grip when holding the ball (static balance) <input type="checkbox"/> Locks elbows in extension <input type="checkbox"/> Does not weight bear on all four limbs in four-point kneeling <input type="checkbox"/> Slouched posture in sitting <input type="checkbox"/> Inattentive behaviour (instructions need to be repeated more than once) <input type="checkbox"/> Hyperactive behaviour 	<ul style="list-style-type: none"> <input type="checkbox"/> Area or areas identified as weak_____ in lion posture <input type="checkbox"/> Area or areas identified as weak_____ in sitting posture

10) Eye Tracking

	1	2	3	4	5		
<p><i>Different Planes the child is expected to track objects with their eyes:</i></p> <ol style="list-style-type: none"> 1. Tracking in a vertical plane 2. Tracking in a horizontal plane 3. Tracking in a diagonal plane 4. Tracking in a circular plane 	<p>Comments:</p>					<ul style="list-style-type: none"> <input type="checkbox"/> Sitting in a slouched posture <input type="checkbox"/> Makes use of head movements instead of eye movements in the _____ plane <input type="checkbox"/> Makes use of eye movement independent of head movement <input type="checkbox"/> Poor Motility in _____ eye <input type="checkbox"/> Loss of balance when making use of head movements <input type="checkbox"/> Wandering from eyes from the target in the _____ plane <input type="checkbox"/> Eyes watering <input type="checkbox"/> Squinting (strabismus) <input type="checkbox"/> Elicitation of nystagmus (may be normal in the extreme periphery) <input type="checkbox"/> Hyperactive behaviour <input type="checkbox"/> Inattentive behaviour 	<ul style="list-style-type: none"> <input type="checkbox"/> Can track in the <i>vertical</i> plane <input type="checkbox"/> Cannot track in the <i>vertical</i> plane <input type="checkbox"/> Can track in the <i>horizontal</i> plane <input type="checkbox"/> Cannot track in the <i>horizontal</i> plane <input type="checkbox"/> Can track in the <i>diagonal</i> plane <input type="checkbox"/> Cannot track in the <i>diagonal</i> plane <input type="checkbox"/> Can track in the <i>circular</i> plane <input type="checkbox"/> Cannot track in the <i>circular</i> plane

11) Ideation Challenge

<ul style="list-style-type: none"> Exploring and ideating a game with a 20cm cloth Game the child played: _____ _____ _____ _____ _____ _____ 	1	2	3	4	5	<input type="checkbox"/> Hyperactive behaviour <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Does not use language to describe the activity <input type="checkbox"/> Does not recognize the properties of the cloth e.g. cannot identify that it is used for washing <input type="checkbox"/> Becomes frustrated	<input type="checkbox"/> Cannot play with the Cloth <input type="checkbox"/> Can play with the Cloth <input type="checkbox"/> Time it takes the child to initiate play_____
	<i>Comments:</i>						

12) Tongue Movements

<i>Tongue movements the child is expected to perform:</i> <ol style="list-style-type: none"> Circular movement (95%) Side to side movement 	1	2	3	4	5	<input type="checkbox"/> Incoordination <input type="checkbox"/> Cannot sustain tongue protrusion <input type="checkbox"/> Dribbling <input type="checkbox"/> Associative movement <input type="checkbox"/> Inattentive behaviour <input type="checkbox"/> Hyperactive behaviour	<input type="checkbox"/> Can perform the circular movement (95%) <input type="checkbox"/> Cannot perform the circular movement <input type="checkbox"/> Can move tongue side to side <input type="checkbox"/> Cannot move tongue side to side
	<i>Comments:</i>						

Appendix 3: Phase 2-Measurement Instrument (Data Collection)

THE CLINICAL OBSERVATIONS							
This Document was compiled by consulting the Clinical Observations by SAISI (2005), The Clinical Observations of Gross Motor Items by SAISI (2004), the Revised Clinical Observations by SAISI (2016) and telephonic interviews with Ray-Ann Cook (Co-Author of the Clinical Observations of Gross Motor Items, the Revised Clinical Observations and expert paediatric occupational therapist)							
Number of Child: _____			DOB of Child: _____				
Gender of Child: F / M Not established			Hand Dominance: L / R /				
Eye Dominance: L / R / Not established _____/2019			Date of Assessment: _____				
1. ATNR		R ATNR	1	2	3	4	5
		L ATNR	1	2	3	4	5
Degrees R Arm: _____° Arm: _____°			Degrees L _____°				
Active, L / R differences: Yes / No							
SH Parameter	Head turned R (Passive)	Head turned L (Passive)	Code				
Elbow Flexion ↓ 25°			ATNR1				
No changes in joint position			ATNR2				
Maintains head position			ATNR3				
SNH Parameters	Head turned R (Passive)	Head turned L (Passive)	Code				
Elbow flexion ↑ 25°			ATNR5				
Locks or fixates elbows			ATNR6				
Resistance to head turning			ATNR8				
Body Swaying			ATNR9				
Unable to maintain head position			ATNR10				
Extension of leg on face side			ATNR12				
Moves hips over to the side			ATNR13				
Loses balance			ATNR14				
Associative Reactions with mouth			ATNR15				
2. RIP			1	2	3	4	5
R RIP: _____ Seconds			L RIP: _____ Seconds				
SH Parameters	R RIP	L RIP	Code				
No Changes in Joint position			RIP1				

Maintains head position									RIP2		
Keeps leg straight									RIP3		
Keeps back straight									RIP4		
Leg in line with hip									RIP5		
SNH Parameters	R RIP		L RIP						Code		
Locks elbows									RIP6		
Resistance to head turning									RIP7		
Body swaying									RIP8		
Unable to maintain head position									RIP9		
Unable to maintain arm position									RIP10		
Unable to maintain leg extended									RIP11		
Curves back									RIP12		
Retracts chin into shoulder									RIP13		
Opens shoulders and turns body									RIP14		
Loses balance									RIP15		
Associative reaction of mouth									RIP16		
3. STNR							1	2	3	4	5
SH Parameters	Head Flexion		Head Extension						Code		
No Changes in joint position									STNR1		
SNH Parameters	Head Flexion		Head Extension						Code		
Locks elbows									STNR2		
Resistance to head turning									STNR3		
Unable to maintain head position									STNR4		
Associative reactions of mouth									STNR5		
Elbow flexion									STNR6		
Rounded back									STNR7		
Posterior pelvic tilt									STNR8		
Cannot hold position when head in flexion									STNR9		
Hyperextension of elbows									STNR10		
Lordosis									STNR11		
Anterior pelvic tilt									STNR12		
Cannot hold position when head in extension, or goes onto haunches									STNR13		
4. Bilateral Ball Hitting							1	2	3	4	5
SH Parameter	Seated Cross Legged								Code		
Makes use of midline-crossing									BBH1		
Maintains bum flat on the floor									BBH2		
Trunk rotation and weight shifting									BBH3		

Does not let go of foil roll						BBH6
Elbow flexion and extension						BBH7
Smooth Arm Movements						BBH8
Able to follow instructions						BBH9
SNH Parameters	Seated Cross Legged					Code
Shifts bum and body to bring ball back into the midline						BBH10
Unable to maintain bum flat on floor						BBH11
↓ trunk rotation and weight shifting						BBH12
Avoidance reaction to ball						BBH14
Let's go of foil roll						BBH17
Maintains elbows extended						BBH18
Rigid arm movements						BBH19
Unable to follow instructions/ requires instructions to be repeated						BBH20
Associative reaction of mouth						BBH21
5. Touch accuracy						
						1
						2
						3
						4
						5
Number of locations the child could point to: _____						locations
SH Parameters	Index Finger	Fore-arm	Thumb	Dorsal Aspect of Hand		Code
Quick response to tactile input (Takes less than 10 seconds to identify)						TTA1
SNH Parameters	Index Finger	Fore-arm	Thumb	Dorsal Aspect of Hand		Code
Inaccurate pointing to body part						TTA2
Delayed response to touch (Takes 10 seconds or more to react)						TTA3
Requires more pressure to locate position						TTA4
Uses verbal prompts to try and identify body parts						TTA5
Rubs or scratches on the location where the examiner touches						TTA6
SNH Parameters	General Observations					Code

Decreased eye contact		TTA7
Negative Emotional response	Cries / hitting / Pulled Face / Moaned Comment:	TTA8
Refusal to participate in activity		TTA9
Inattentive behaviour	Difficulty sustaining attention / Not listen when spoken to directly / does not follow instructions / resistant to complete activity / distracted by extraneous stimuli	TTA10
Hyperactive and impulsive behaviour	Fidgets / struggles to maintain seated position / tries to get up and run or climb / talks excessively	TTA11
6. Tactile Perception		3D Objects
		1 2 3 4 5
		2D Objects
		1 2 3 4 5
3D Objects		2D Objects
L Hand:	/2	L Hand: /2
R Hand:	/2	R Hand: /2
Both Hands:	/2	Both Hands: /2
SH Parameter	3D Objects	2D Objects
Can listen and follow instructions		
Able to complete the entire activity		
SNH Parameters	3D Objects	2D Objects
Resistant to put hand or hands in box		
Does not want to maintain hand or hands in box		
Attempts to look inside box		
Often drops objects in box		
Attempts to distract the examiner from the activity		
Difficulty finding object in box		
Tries to redo initial try/ Compensates for mistakes		
SNH Parameters	General Observations	Code
Shy to interact with activity or avoidant		TP9
Appears confused by the activity		TP10
Explosive emotions or anxiety		TP11
Refusal to complete activity		TP12
Associative Reaction of Mouth		TP13

Decreased eye contact								TP14
Inattentive behaviour	Difficulty sustaining attention / Not listen when spoken to directly / does not follow instructions / resistant to complete activity / distracted by extraneous stimuli							TP15
Hyperactive and impulsive behaviour	Fidgets / struggles to maintain seated position / tries to get up and run or climb / talks excessively							TP16
7. Co-contraction			Upper Limbs:	1	2	3	4	5
			Neck:	1	2	3	4	5
SH Parameters	Upper Limbs		Neck				Code	
Maintains balance							CC1	
Upright posture							CC2	
No changes in arm position							CC3	
No changes in head position							CC4	
SNH Parameters	Upper Limbs		Neck				Code	
Whole body movements in the direction of force or the opposite direction to the force							CC5	
Flexes elbows in response to force							CC7	
Inability to understand and follow instructions							CC8	
Loses balance							CC9	
Slouched posture							CC10	
Locks elbows in extension							CC11	
Left right upper limb differences (holding ball)							CC12	
Left right differences (neck)							CC13	
Chin Poke							CC14	
Unable to maintain hands on lap							CC15	
Elevates shoulders							CC16	
Scrunches eyes together							CC18	
Associated reaction of mouth							CC19	
Increases grip strength on ball							CC20	
Drops Ball							CC21	
Widens base of support							CC22	
Crosses ankles							CC23	
8. Proximal Joint Stability of the hips and shoulders			R Hip and ULS	1	2	3	4	5
Left Right Differences: Yes / No			L Hip and ULS	1	2	3	4	5
			Anterior	1	2	3	4	5
			Posterior	1	2	3	4	5
SH Parameters	R Hip and ULS	L Hip and ULS	Anterior	Posterior	Code			
No changes in posture					PJS1			
Maintains balance					PJS2			
SNH Parameters	R Hip and ULS	L Hip and ULS	Anterior	Posterior	Code			

Joints move in the direction of force						PJS3		
Fixation of upper limbs						PJS4		
Hyperextension of elbows						PJS5		
Elbow flexion						PJS6		
Crossing of ankles						PJS7		
Widens base of support						PJS8		
Does not weight bear on all four limbs						PJS9		
Loses balance						PJS10		
Moves hips over to side						PJS11		
Falls back onto haunches						PJS12		
Lordosis						PJS13		
Rounded Back						PJS14		
Clenches Jaw and Teeth						PJS15		
9. Slow Movements						1 2 3 4 5		
The hand which arrives first:		L / R / Both						
Time without examiner:		Seconds						
SH Parameters		Seated on chair				Code		
Some left right difference						SM1		
Well controlled Shoulder movement						SM2		
Smooth and fluid movement						SM3		
Full elbow extension						SM4		
Shoulder abduction to 90°						SM5		
SNH Parameters		Seated on chair				Code		
Shoulders dropping						SM6		
Rigid arm movements						SM8		
Did not fully extend elbows						SM9		
Did not fully abduct shoulders to 90°						SM10		
Visually monitors movement						SM11		
Slouched seated posture						SM12		
Widens base of support						SM13		
Crossing of ankles						SM14		
Unable to maintain feet flat on floor						SM15		
Associative reactions with mouth						SM16		
10.1. Eye Tracking			Visual Pursuits:	1	2	3	4	5
Independent Eye Closure: Right: Yes / No Left: Yes / No			Midline-crossing:	1	2	3	4	5
			Convergence:	1	2	3	4	5
			Quick Localisation:	1	2	3	4	5
SH Parameter	Visual Pursuits	Midline-crossing			Convergence	Quick Localisation		Code
		B	R	L				
Visual fixation on object								EY1
Smooth coordinated eye movements								EY2
Eyes move in unison								EY3

Eyes move independently from head									EY5	
SNH Parameter	Visual Pursuits	Midline-crossing			Convergence	Quick Localisation	Code			
		B	R	L						
Difficulty fixating on object									EY6	
Rigid movement									EY7	
Loses focus when crossing the midline									EY8	
Eyes do not move in unison									EY9	
Makes use of head movements									EY13	
Excessive Blinking									EY14	
Eyes water									EY15	
Associative reaction of mouth									EY16	
Slouches in seat									EY17	
10.2. Eye Tracking Continued					Moving hand	1	2	3	4	5
					Moving head	1	2	3	4	5
SH Parameter	Moving hand			Moving head					Code	
Visual fixation on object									EYY1	
Smooth coordinated eye movements									EYY2	
Eyes move in unison									EYY3	
Able to make use of dissociation									EYY4	
SNH Parameter	Moving hand			Moving head					Code	
Difficulty following instructions									EYY5	
Difficulty fixating on object									EYY6	
Rigid movement									EYY7	
Loses focus when crossing the midline									EYY8	
Eyes do not move in unison									EYY9	
Eyes water									EYY13	
Excessive Blinking									EYY14	
No Dissociation									EYY15	
Associative reaction of mouth									EYY16	
Slouches in seat									EYY17	
11.Tongue and Lip Movements					Side to Side:	1	2	3	4	5
					Up & Down:	1	2	3	4	5
					Circular:	1	2	3	4	5
					T. Wagging	1	2	3	4	5
SH Parameter	Up and down	Side to side	Circular	Tongue Wagging	Code					
Smooth movement					TM1					
Maintained tongue protrusion					TM2					

SNH Parameter	Up and down	Side to side	Circular	Tongue Wagging	Code			
Jerky movement					TM3			
Pursing of lip					TM4			
Cannot sustain tongue protrusion					TM5			
Involuntary tongue protrusion					TM6			
Dribbling					TM7			
Associated movement of head					TM8			
Associated movement of jaw					TM9			
Poor mouth closure					TM10			
Tongue jerks in corner of mouth					TM11			
Reduced speed of motion					TM12			
Slouches in seat					TM13			
11. Lip movements			Kissing Face	1	2	3	4	5
Kissing Face: _____ Seconds			Blow up Cheeks	1	2	3	4	5
Blow up Cheeks: _____ Seconds								
SH Parameters	Kissing Face		Blow up Cheeks			Code		
Able to assume facial expression						LM1		
Able to maintain facial expression for 10 seconds						LM2		
SNH Parameters	Kissing Face		Blow up Cheeks			Code		
Unable to assume facial expression						LM3		
Unable to maintain facial expression for at least 10 seconds						LM4		
Drooling								
Unable to push lips forward						LM5		
Air escapes from lips						LM6		
Jumping sequence in standing			Jumping sequence	1	2	3	4	5
			Jump hop sequence	1	2	3	4	5
			Open and close legs	1	2	3	4	5
SH Parameter	Jumping sequence	Jump hop sequence	Open and close legs			Code		
Jumps with feet together						JS1		
Bilateral landing in jump						JS2		
Follows sequence						JS3		
Continuous movement in sequence						JS4		
Can maintain balance						JS5		

Controlled stop				JS6
Graded landing				JS7
Finishing within 4m distance or reaching 4m marker				JS8
Keeps arms against body				JS9
SNH Parameter	Jumping sequence	Jump hop sequence	Open and close legs	Code
Unable to maintain feet together in jump				JS10
Unable to accurately execute sequence				JS12
Maintains legs stiff/ in extension				JS13
Starts and stops the sequence				JS14
Cannot control stop				JS15
Poorly graded landing				JS16
Finishing beyond or behind the 4m marker				JS17
Abducts arms more than 15°				JS18
Flexes elbows				JS19
Cannot readjust posture when landing				JS20
Asks or requires the examiner to repeat demonstration of sequence				JS21
Associative reactions of mouth				JS22

12. Ideation challenge	1	2	3	4	5
Number of Ables the child could identify:	_____ Ables				
Time the child stopped the activity: min or until un-productive)	_____ Minutes (Time 5				
SH Parameter	Standing		Code		
Wash Able			IC1		
Clean Able			IC2		
Put on floor Able			IC3		
Stand on Able			IC4		
Pendulum Swing Able			IC5		
Wring/ Twist Able			IC6		
Pass around body Able			IC7		
Fan Able			IC8		
Spin in circle Able			IC9		
Bite Able			IC10		
Scrunch Able			IC11		
Throw Able			IC12		
Twirl Able			IC13		
Wrap around Able			IC14		
Whip Able			IC15		
Stretch out between two hands Able			IC16		
Hold against body Able			IC17		
Jump over or on Able			IC18		
Fold Able			IC19		
Other Able, Specify:			IC20		
_____			_____		
_____			_____		
_____			_____		
SH Parameter	Standing		Code		
Explosive emotions			IC21		
Uses language to describe the activity instead of demonstrating actions			IC23		
Inattentive behaviour			IC24		
Shy to interact with washcloth			IC25		
Tries to incorporate other objects in the activity			IC26		

Appendix 4: School information letter and Permission form in English



DEPARTMENT OF OCCUPATIONAL THERAPY, UNIVERSITY OF THE FREE STATE

205 Nelson Mandela Drive ▪ Park West ▪ Bloemfontein ▪ 9301
PO Box 339 ▪ Bloemfontein ▪ 9300 ▪ South Africa

www.ufs.ac.za

Dear Principal,

RE: OCCUPATIONAL THERAPY RESEARCH

I am an occupational therapist with a keen interest in children. As a result, I am currently doing my Master's degree at the University of the Free State (UFS) on the assessment of five-year-old children. I hope to contribute on the existing knowledge of child assessment in occupational therapy.

What is occupational therapy?

When specifically working with children occupational therapists assess and then treat identified children, that experience delays in typical development. The goal of occupational therapy treatment is to enable children to reach their full potential in all aspects of life such as school, their relationships with friends and simply playing on the playground.

An explanation of the study:

In order to identify the problems children may face in their day to day lives therapists must make use of different assessments. Therapists often make use of observations in the assessment process. A popular observational assessment used by therapists is Clinical Observations developed by an organisation called the SAn Institute of Sensory Integration (SAISI). The problem with this assessment is that it was originally developed in America so we are not sure if the assessment is applicable to SAn children as little research has been done on how SAn children do in this assessment. This has a negative impact on the quality of this assessment in that we are not sure if the assessment picks up problem's children may face in South Africa.

What is the purpose of the study?

I will investigate the performance of children five years and six months to five years and 11 months in the Buffalo City Metro, on 12 subtests of the Clinical Observations. The study will add to existing knowledge explaining how five-year-old children develop, specifically in South Africa. Ideally, the goal is to include 100 children in the study. Specifically, at your school, I hope to assess 46 learners (23 girls and 23 boys). It takes roughly 45 minutes to assess a child.

The researcher aims to publish the content of the study in a recognised journal and use information obtained to train future therapists.

What are the benefits of the study?

The study wishes to contribute towards making assessments that are specific for SAn children. This will make it easier to find problems children may face that can have a negative impact on their relationships, school performance and play activities. Additionally, the age group selected for assessment are

almost entering formal schooling, improvement in this assessment could mean that it can be used for identifying possible developmental difficulties or challenges. Through your participation in the study, you will be help with the improvement of assessment in occupational therapy and understanding of how children develop in South Africa.

Who will be involved in the study?

- Children between five years six months to five years 11 months of age.
- Children who can speak one of the following languages fluently: English, Afrikaans or isiXhosa (Please note an interpreter will be used in the case of isiXhosa speaking children).
- Children whose parents have returned a written consent form which allows them to participate in the study.
- Children who give permission to participate in the study (the study will be explained to children in simple language and using pictures).
- Children with no known medical diagnoses e.g. Autism, ADHD or Epilepsy etc.
- Children who are not receiving any therapy e.g. speech therapy, occupational therapy, and physiotherapy etc.
- Children who are not currently on any medication that may alter their attention e.g.
Ritalin®.

If you choose to participate you will be asked to provide the following equipment as far as possible and to assist with the following:

- A room
Time to conduct assessments in school times, this does not include the break times of children
- Help to identify children who are suitable for the study
- Help with reminding parents to return informed consent forms, allowing their child to participate in the study

What will be expected from the potential participants (Children)?

- To give permission to participate in the study (please note, children will not be forced to participate in the study).
- To cooperate in assessment using the clinical observations on 12 subtests e.g.
checking reflexes, tongue movements and eye movements to name a few.
- To be assessed for a duration of 30-40 minutes.

The use of video recordings:

Video recordings will be used to allow playback of assessment sessions for accurate scoring. Filming of videos may be completed by a third party who has signed a disclosure agreement so that information obtained remains confidential.

Video recordings will only be accessible to the researcher and parents of children on request.

The videos will be kept on a secure USB device with password accessibility.

Ethical Aspects of the study:

- The study has been approved by the Health Sciences Research Ethics Committee (HSREC) of the University of the Free State (UFS) and the DoE in the EC.
- No financial compensation will be given to schools, parents or participants (children) participating in the study.
- Participants will not be forced to partake in the study.
- Your school and parents involved will need to give formal consent for participation and the researcher will not continue with the study until the date that consent is received.
- Each child will be given a clear explanation of each subtest they will be assessed before they give permission to participate in the study.
- Each child will be given a code (number) by which they will be identified by and their personal information will be kept strictly confidential.

Will feedback be given to parents?

It is the ethical duty of the researcher not to deny participants the right to intervention possibilities. The researcher will not provide any intervention, but will give each parent whose child is participating in the study feedback on their child's performance and recommend if further assessment or intervention should take place.

Thank you for taking the time to read the information document. I hope that you will consider participation in the study and become a key stakeholder in the completion of this study.

Yours faithfully,

Elana Janse van Rensburg, B. OT (UFS)

0763960150

elanajvr@gmail.com

Signature:



English Permission Form – Schools

CONFIDENTIAL

I _____ school principal or acting head of _____ (school) hereby give permission for five-year-old children attending said school to participate in the study.

I am cognisant that neither the school nor the children participating in the study will receive any compensation for participation. I declare that I will assist the researcher to identify children to participate in the study or appoint a classroom teacher that can assist the researcher in identifying participants for the study.

I will appoint a room for the researcher to complete the study. I understand that video recordings will be used for the sake of ensuring quality carry out of research.

Lastly, I am aware that the researcher follows a strict policy to keep all information obtained from the school, parents, and learners strictly confidential and will not disclose information to persons not directly involved in the study.

Signature: _____

Date: _____

Appendix 5: Parent information letter and consent form in English



DEPARTMENT OF OCCUPATIONAL THERAPY, UNIVERSITY OF THE FREE STATE

205 Nelson Mandela Drive ▪ Park West ▪ Bloemfontein ▪ 9301
PO Box 339 ▪ Bloemfontein ▪ 9300 ▪ South Africa
www.ufs.ac.za

Dear Parent,

RE: OCCUPATIONAL THERAPY RESEARCH

I am an occupational therapist; I enjoy working with and helping children. As a result, I am currently completing my Master's degree at the University of the Free State (UFS) on the assessment of children. I hope to develop the existing knowledge of child assessments in occupational therapy.

What is occupational therapy?

When occupational therapists work with children they assess and treat them, if they are behind on typical development. This is done to assist children to reach their full potential in all aspects of life such as school, their friendships with other children and simply playing on the playground.

An explanation of the study:

Occupational therapists use different ways to test children's development. One way to test development is to look at a child doing different things with their body, such

as moving their eyes or limbs, to see if they can do it in a coordinated manner. We call this way of looking at a child's movements during tasks, "Clinical Observations". The current Clinical Observations by the SAn Institute for Sensory Integration was originally developed in America so we are not sure if the assessment is effective on SAn children. This is because little research has been done on how SAn children do in this assessment. The researcher hopes that by describing the performance of five-year-old children from Buffalo City Metro on 12 subtests of the revised Clinical Observations, a better understanding will be gained of how SAn children perform on these "Clinical Observations" so that we can test SAn children more accurately with this tool.

What is the purpose of the study?

The researcher will investigate the performance of children five years and six months to five years and 11 months in the Buffalo City Metro, on twelve subtests of the Clinical Observations. The study will add to existing knowledge explaining how five-year-old children develop, specifically in South Africa. The researcher would like to assess 100 children.

The researcher aims to publish the content of the study in a recognised journal and use information obtained to train future occupational therapists.

What are the benefits of the study?

The study wishes to contribute towards making assessment specific for SAn children. This will make it easier to find problems children may face that can have a negative impact on their social relationships, school performance and play with others. Through your participation in the study, you will be an important help in the improvement of assessment in occupational therapy and understanding of how children develop in South Africa.

Your child will be able to participate in the study if they meet the following criteria:

- Between the age of five years six months to five years 11 months.

- Able to speak of the following languages fluently: English, Afrikaans or isiXhosa (Please note a talk will be used in the case of isiXhosa speaking children).
- Your written consent for your child to take part in the study.
- Your child gives assent to take part in the study (the study will be explained to your child in simple words and through the use of pictures).
- Has no known medical diagnoses e.g. Autism, ADHD or Epilepsy etc.
- Your child has not prior received occupational therapy, speech therapy or physiotherapy therapy intervention.
- Is not currently on any medication that may alter their attention e.g. Ritalin®.

What do I expect from you?

- To kindly return your consent within the next five days, agreeing that your child may participate in the study.
- To contact me if you have any questions and would like me to help you understand the study.

What will be expected from your children

- To give their own permission to be assessed (please note they will not be forced to participate in the study).
- To cooperate in assessment using clinical observations on 12 subtests e.g. moving their eyes and moving their tongues.
- To be assessed for 30-40 minutes.

The use of video recordings:

The researcher will make use of video recordings of the assessment of children using the clinical observations. This will allow the researcher to replay these assessments so that she can check whether her observations were correct. A third person will be present in the assessment to film video recordings, this person will have to sign a document that says they may not speak out about the assessments they observed.

Video recordings will only be accessible to the researcher and parents of children on request.

The video recordings will be kept on a secure USB device with a password.

Ethical Aspects of the study:

- The study has been approved by the Health Sciences Research Ethics Committee (HSREC) of the University of the Free State and the DoE in the EC.
- No financial compensation will be given to you or your child to participate in the study.
- Your child will not be forced to partake in the study.
- You and your child will need to give informed consent for participation in the study and the researcher will not continue with the study.
- Children will have to agree that they would like to be assessed by the researcher. They will be explained what they will do in the assessment by using simple pictures they can understand. If they do not want to participate in the study, they will not be included in the study.
- Each child will be given a number to identify them by and none of their personal information will be used.

Feedback

If your child participates in the study, feedback will be given on their performance.

However, the researcher will not treat your child at any point.

Thank you for taking the time to read the information document. I hope that you will consider allowing your child to participate in the study.

Yours faithfully,

Elana Janse van Rensburg, B. OT (UFS)

0763960150

elanajvr@gmail.com

Signature:



PARENT CONSENT FORM

Name of Child: _____

Date of Birth: _____

Class: _____

Herewith I give consent for my child to participate in the study. I understand that the researcher will keep my child's personal information strictly confidential and that the researcher will handle my child with their utmost integrity and respect. Through giving consent I give the researcher full permission to make use of video recordings of my child for research purposes and am aware that the video recording will be accessible to me on request.

Further, I am aware that my child will not receive occupational therapy treatment in the research process. I am aware that feedback will be given back to me in the form of an information letter and when applicable the researcher will provide me with recommendations.

I am aware that if at any point that I feel uncomfortable with my child's participation in the study I can withdraw my child from the study without any negative consequences.

If I have any questions or uncertainties, I understand that I have the right to contact the researcher at any point to answer my questions or give me clarity regarding the study.

Please can you answer the following questions:

Circle the correct answer

1) Is your child on any medications:

Yes / No

If you answered yes, please specify the name of the medication(s):

2) Has your child ever received any form of therapy e.g. speech therapy, occupational therapy, physiotherapy, educational psychology or any other form of therapy?

Yes / No

3) What is your child's language of preference?

English / Afrikaans / isixhosa / Other

If other, please specify their language of preference:

4) Has your child ever been diagnosed with a medical condition?

Yes / No

If you answered yes, please specify the name of the medical condition:

Parent/Guardian Signature:

Date:

Appendix 6: Parent information letter and consent form in isiXhosa



DEPARTMENT OF OCCUPATIONAL THERAPY, UNIVERSITY OF THE FREE STATE

205 Nelson Mandela Drive ▪ Park West ▪ Bloemfontein ▪ 9301
PO Box 339 ▪ Bloemfontein ▪ 9300 ▪ South Africa

www.ufs.ac.za

Mzali Ohloniphekileyo,

RE: OCCUPATIONAL THERAPY RESEARCH

Ndiyincali kwezonyango msebenzi, onomdla omkhulu ebantwaneni, njengangoku ndigqibezela imfundo yam enomsila kwiziko loqeqesho elise Freyistata (UFS) ekuvanvanyeni abantwana, nasekuphuhliseni ulwazi kwezonyango novavanyo lo msebenzi nokwenza ngcono isakhono sam.

Yintoni uvavanyo lomsebenzi?

Xa ngokukhethekileyo usebenza ngabantwana njengencali kwezonyango lomsebenzi, uvavanya abantwana abasemva ngokukhula, ukwenza, nabo bafikelele kwizinga ngamandla abo, kuzo zonke iinkalo zokukhula, nobomi njengasesikolweni, ekuhlaleni, nasemabaleni okudlala.

Inkcazelo ngesifundo:

Ukwenzela sikwazi ukubona iingxaki zabantwana abajongene nazo kubomi babo bemihla ngemihla. Ingcali yonyango lomsebenzi mayenze ulungiselelo vavanyo. Ingcali zonyango lomsebenzi maxesha onke zisebenzisa uqwalaselo vavanyo nkqubo. Uqwalasela uvavanyo oluqhelekileyo olusetyenziswa zingcali vavanyo lomsebenzi libizwa ngokuba (clinical observation) eyasekwa ngumbutho obizwa ngokuba yi (SAn Institute of Sensory Integration – SAIS). Ingxaki ngoluvavanyo lalivela eMelika ngoku akuqinisekwanga ukuba lingasetyenziswa ngabantwana base Mzantsi. Lo mbutho ubenegalelo elibi.

Yintoni injongo zesisifundo?

Mna ndizakuqubeka nezifundo zakhe ndiphenya ukusebenza ngabantwana abaneminyaka emihlani apha eBuffalo City Metro. Ndangeze ezinye izinto ngakumbi apha eMzantsi Africa iimibono nenjongo kukuba ezizifundo zigxale kumyinge wabantwana abamashumi asibhozo. Umphandi ujonge ekushaleleni umongo wesifundo kwiphepha eliqatshelwayo (Medical Journal). Usebenzisa ulwazi analo ukulolonga iqeqeshe iingcale vavanyo lomsebenzi zangomso.

Uyakuzuza njani kwesisifundo?

Izifundo zinqwenela ukunikezela sitsale umsila koluvavanyo lomsebenzi. Ukwenzela abantwana base Mzantsi. Lento izakuphuhlisa ukuqwalaselwa kweenkathazo neengxaki abathi abantwana bajonane nazo ezinokubanga uxinzelelo elungelulo ekuhlaleni, esikolweni, nasemabaleni naxa bedlala nabanye abantwana. Ekuzameni ukonyusa oluvanyo lemisenbenzi nokuqonda indlela yokulwandia apha eMzantsi Afrika.

Umntwana wakho uyakulungela ukungena kwezizifundo xa ehlangabenzana nezifundo:

- Zombini izimni esobuduna nobukhomokazi amakwekwana namantombazana.

- Phakathi kweminyaka emihlanu enenyanga ezithandathu, nemimyako emihlanu enenyanga ezilishumi elinanye.
- Akwazi ukuthetha ezinye zezelwimi, Isilungu, Isibhulu kunye nesiXhosa.
- Ongenaso isigulo esinokuba noxinzelelo ekungeveni, bonemi, nasekunyakazemi kwamalungu.
- Ongekho kumayeza anokumphazamiso kwinqalelo e.g. amayeza we-ADHD okanye uxhuzulo.
- Mntwana wakho zange ngaphambili afumane unyango, mluleki mzimba, Umeluleki wozolwimi, Ingcali kwezonyango msebenzi.

Ndilindele ntoni kuwe?.

- Nceda ngokuzithoba okukhulu ubuyise isivumelewano esivumela umntwana wako angenelele kwezisifundo, kwintsuku ezintlanu ezizayo.
- Unganditsalela umnxeba ukuba kukho izinto ongathanda ndikucacisele zona ongaqiniskanga ngazo.

Into elindelweyo emntwaneni wakho?

- Ukunika imvume yokungenela (nceda qwalasela akukho sinyanzeliso ekungeneni kwezizifundo).
- Ukubambisana koluvavanyo sisebenzisa unyango lomsebenzi kwimqolwana elishumi yovavanyo.

Ukusetyenziswa komabonakude wokushicilela:

Umabona kude wokushicilela uzakusetyenziswa ukuvumela ukudlalwa emva kovavanyo ngexesha iziphumo ezishicilelweyo ukwnezela iziphumo ezicacileyo. Zovavanyo. Uzakuhlolwa ngugqira wabantwana ukuthintela iziphumo ezingacaca nga. Umabona kude woshicilelo ungabonako ukusetyenziwa ngumphandi nabazal babntwana xa becelilie. Umabonakude woshicilelo uzakugcinwa eluvalelwenilwangaphandle (hard drive) kusetyenziswa inombolo yokuvula (password).

Imiba elindelekileyo yokuziphatha kwesisifundo:

- Isifundo sivunyiwe yi-Health Science Research Ethics Committee (HSREC).
- Akukhontlawulo ezonikwa wena okanye umntwana ekungeneleleni kwisifundo.
- Abangeleni (abantwana benu) abazokunyanzelwa okanye bahlawulise ekuthatheni inxaxheba kwesisifundo.
- Akukho bantwana abalovavanyo ngaphandle kwemivume nencazelo elzicileyo kusongasiny isiqendwana sovavyo abkube bevavaywa ngaso.
- Umtwana ngamnye uzakunikwa inombolo (code) abazakohlulwangayo nencukacha ngabo zizakugcinwa zinyinmfihlo yaye zikhuselekile.
- Izikolo nabazali ababandlanyekayo kwakufneka banikezele ngemivume yokuthatha inxaxheba nomphandi azokuqhubeka ngezifundo de ibenummhla wokunikezelwa kwemvume.

Igaba impendulo iyakunikwa kubazali?

Ngumba nomsebenzi womphandi ukuba avumele abangeneleli imvume zenkathalo kwezempilo. Umphandi uzakunikela umzali ngamnye omgumgeneleli kwizifundo impendulo ngomntwana ngequbo yomntwana wake amncome.

Xa kukho ungenelelo olulolunye.

Enkosi ngokuthatha ixesha lokufunda incwadi yencukacha. Ndiyathemba ukuba uzakuyithathela ingqalelo ungenelo kwesisifundo kwabe ubengomnye wabantu ababandakanyekayo ekugqityweni koluphando mfundo.

Okakho Ozithobileyo,

Elana Janse van Rensburg, B. OT (UFS)

0763960150

elanajvr@gmail.com

Signature:



PARENT CONSENT FORM

Name of Child: _____

Class: _____

Ndilapha, mna ndinikezela ngemvume yokuba umntwana wam athathe inxaxheba zophando. Ndiqinisekile ukuba umpandi uyakugcina incukacha ngomntwana ngqongqo ziyimfihlo, zifihlakele, nokunye umphandi uyakumphatha umntwana ngokuthembeka ngentlonipho enkulu. Kuyo imvume endiyinike umphandi ukwenza umabona kude woshicilelo lomntwana ndisazi ngokujalo, ndiqinisekile ukuba umabonakude woshicilelo ndakuwufumana xa ndicelile soze unikezelwe ukulahlwa, okunye ndiyazi ukuba umntwana soze alufumane uvavanyo nyango kolophando nkquba.

Ndiqinisekile ukuba impendulo ndiyakuzifumana ngendlela yencukacha mbalelwano, okanye xa kufuneka umphandi anikezele kum isincomo. Ndiyazi ngokuzeleyo xa kunokwenzeka ngelinye ixesha ndizive ndingohelisebanga ngokungela komntwana wam kwizifundo phando ndigamrhoxisa umtana wam koluphando lwezifundo.

Nceda ngokuzithoba uphendule le mibuzo ilandelayo:

Please can you answer the following questions:
*Nceda uphawule ngo X apho kufanelekileyo Okanye ugcwalise
Incukacha*

- 1) Ingaba umntwana wakho akona amayeza awathathayo ngalomzuzu.

Ewe / Hayi

Nceda ucacise ngawaphi amayeza umtana wakho awathathayo:

- 2) Ingaba umntwana wakho ebekhe wafumana naliphina unyango, Ingcali kwezonyango Msebenzi, Mluleki Mzimba, etc.

Ewe / Hayi

- 3) Leliphi ulwimi ongalikhetha lomtana wakho, ukuba kukho limbi cacisa, Isilungu, Isibhulu, IsiXhosa:

English / Afrikaans / isixhosa / Other

- 4) Ingaba umtwana wakho ebekhe wanesifo nangaziphi iindlela? Ewe/Hayi. Ukuba ngu ewe oluphi uhlobo lesifo, ngubani owasibonayo kumntwana wakho?

Ewe / Hayi

Tyikitya: _____

Date: _____

Appendix 8: Assessment date and time schedule for schools

School Name:					
No.	Name of Child:	Assessment Time & Date: (Time may vary)	Class of Student	Venue of Assessment	Date assessment was completed
1	Child 1	14/08/2020 07:30	R1	Library	14/08/2020

Appendix 9: Signed Disclosure Agreements from Interpreters

Disclosure Agreement for Interpreter

This document was compiled with reference to the following sources: (University of Pittsburgh 2018; Legal Wise, 2018)

CONFIDENTIAL

1) Parties

1.1. The parties in this agreement are:

1.1.1. Miss Elana Janse van Rensburg (Researcher)

1.1.2. Yamakele Tshabalala (Name of Interpreter)

2) Preamble

The purpose of this agreement is to ensure that the interpreter (second party) does not disclose any information obtained in the research study: Describing the performance of fiveyear-old children in the Buffalo City Metro on twelve subtests of the revised Clinical Observations by SAISI. The second party must thus maintain all information obtained in the research process and specific to participants strictly confidential.

3) Non-Disclosure

The Parties agree that:

- 3.1. The second party shall treat the Confidential Information of this study in the strictest confidence and will take reasonable precautions to ensure information is not disclosed to any third parties.
- 3.2. The second party will not make use of the information obtained in the study for their own personal gain or interest.
- 3.3. The second party will not share research information in any way or form (verbally, disks, tapes, flash sticks or transcripts).

First Party (Researcher)

Name: Elana Janse van Rensburg Signature:  Date: 1 May 2019

Second Party (Interpreter)

Name: Yamakele Tshabalala Signature:  Date: 1 May 2019

Disclosure Agreement for Interpreter

This document was compiled with reference to the following sources: (University of Pittsburgh 2018; Legal Wise, 2018)

CONFIDENTIAL

1) Parties

1.1. The parties in this agreement are:

1.1.1. Miss Elana Janse van Rensburg (Researcher)

1.1.2. Alhannide Masika (Name of Interpreter)

2) Preamble

The purpose of this agreement is to ensure that the interpreter (second party) does not disclose any information obtained in the research study: Describing the performance of five-year-old children in the Buffalo City Metro on twelve subtests of the revised Clinical Observations by SAISI. The second party must thus maintain all information obtained in the research process and specific to participants strictly confidential.

3) Non-Disclosure

The Parties agree that:

3.1. The second party shall treat the Confidential Information of this study in the strictest confidence and will take reasonable precautions to ensure information is not disclosed to any third parties.

3.2. The second party will not make use of the information obtained in the study for their own personal gain or interest.

3.3. The second party will not share research information in any way or form (verbally, disks, tapes, flash sticks or transcripts).

First Party (Researcher)

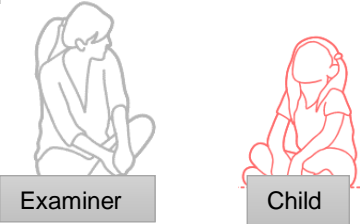
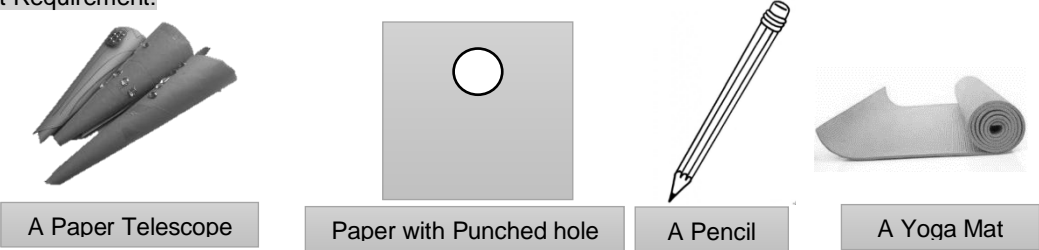
Name: Elana Janse van Rensburg Signature:  Date: 1 May 2019

Second Party (Interpreter)

Name: Alhannide Signature:  Date: 1 May 2019

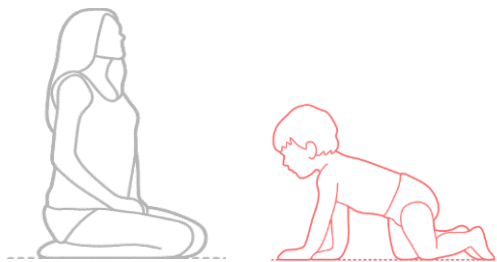
Appendix 10: Revised Clinical Observations- Examiners manual

REVISED CLINICAL OBSERVATIONS- Examiners Manual		
This Document was compiled by consulting the Clinical Observations by SAISI (2005), The Clinical Observations of Gross Motor Items by SAISI (2004), the Revised Clinical Observations by SAISI (2016) and telephonic interviews with Ray-Ann Cook (Co-Author of the Clinical Observations of Gross Motor Items, the Revised Clinical Observations and expert paediatric occupational therapist)		
a) Hand and Eye Preference		
Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> <input type="checkbox"/> A Paper cone or telescope <input type="checkbox"/> A card with a hole in <input type="checkbox"/> A Pencil <input type="checkbox"/> A mat <p>Description: This item allows the examiner to identify the hand and eye preference of the child,</p>	<p>Positioning: The child and examiner shoulder both be sitting cross legged, directly opposite one another and knees nearly touching.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner hands the child a paper telescope at their midline with both hands. The examiner must take note of the hand the child uses to retrieve the telescope. The examiner says to the child, "<i>look at me through this telescope</i>". b. The examiner hands the child a card with a hole in at their midline and with both hands. The examiner must take note of the hand the child uses to retrieve the card. The examiner says to the child, "<i>look at me through the hole</i>". c. The examiner makes a circle with their dominant thumb and index finger. The examiner says to the child, "<i>look at me through this hole</i>". d. If the examiner was still uncertain about the dominance of the child, the child was given a pencil to write their name on the measurement instrument 	<p>Scoring: The examiner records the hand(s) the child used to grasp the object and the eye(s) used for sighting. The examiner should record if dominance is not established.</p>

	(this could easily be rubbed off, to ensure that the examiner had no identifiable characteristics of the child). The examiner observed with which hand the child wrote their name	
<p>Positioning:</p>  <p>Examiner Child</p>	<p>Equipment Requirement:</p>  <p>A Paper Telescope Paper with Punched hole A Pencil A Yoga Mat</p>	
<p>1.1. ATNR</p>		
<p>Equipment, description and time taken</p>	<p>Positioning and Administration</p>	<p>Scoring</p>
<p>Equipment:</p> <ul style="list-style-type: none"> <input type="checkbox"/> A small goniometer <input type="checkbox"/> A Mat <p>Description: This subtest measures the degree to which the ATNR is integrated. The ATNR is a brainstem reflex that usually integrates at 6 months, although it is frequently seen in children aged 3-16 years. The presence of the ATNR is not considered abnormal.</p> <p>Time Taken: This item should take approximately 5 minutes to complete.</p>	<p>Positioning: The examiner asks the child to get on all fours like a dog. The examiner demonstrates the position. The child is expected to assume the four-point-kneeling position: Hips and knees at 90° Flexion and shoulders in 90° Flexion. The child's hands should be flat on the floor and facing slightly inwards. Examiner sits directly in front of the child. Examiner holds the child's head firmly, with both hands on the child's cheeks.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner says: "<i>let me turn your head</i>". The examiner rotates the child's head 90° so that their chin and shoulder are in line. b. The examiner then says, "<i>hold while I measure</i>". c. The examiner should hold the child's head for a few seconds before letting go of the child's head. 	<p>Scoring: The examiner measures the degree of flexion at the elbow by placing the goniometer on the lateral epicondyle. The fixed arm should be in line with the midline of the humerus and the moveable arm faces the lateral midline of the styloid process of the ulna. Once the degree of flexion is measured the examiner terminates the subtest.</p> <p>Grading:</p> <ol style="list-style-type: none"> 1 = Elbow Flexion more than 45° 2 = Elbow Flexion between 36° and 45° 3 = Elbow Flexion between 26° and 35° 4 = Elbow Flexion between 16° and 25° 5 = Elbow Flexion less than 15° or no change in joint position

- d. The examiner must measure the degree of elbow flexion of the contralateral arm to the direction the head is facing.
 - e. Rotate the head to neutral position and wait a few seconds
 - f. Rotate the head 90° to the other side.
 - g. Measure the opposite arms flexion angle.
 - h. Arms are not tested in any particular order
- Precautions:**
- When the child assumes the starting position (four-point-kneeling), it is important to ensure that the child's elbows should not be locked in hyperextension
 - Take care not to rotate the head too far as this will stimulate the ATNR.

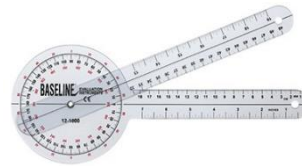
Positioning:



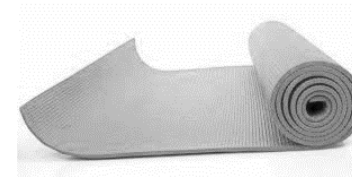
Examiner

Child in Four Point Kneeling

Equipment:



A Small/ Finger Goniometer



A Yoga Mat


1.2. RIP (Reflex Inhibiting Posture)

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> • A Mat • Stop watch 	<p>Positioning: The examiner asks the child to get onto all fours like a dog. The examiner demonstrates the position. The child is expected to assume the four-point-kneeling position: Hips</p>	<p>Scoring: The examiner times the duration the child is able to maintain the reflex inhibiting posture. If the child loses their balance or drops their arm or leg, they</p>

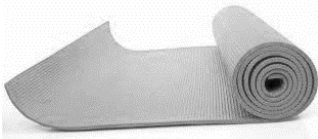
<p>Description: This subtest measures the degree to which the ATNR is integrated. The ATNR is a brainstem reflex that usually integrates at 6 months.</p> <p>Time Taken: This item should take approximately 5 minutes to complete.</p>	<p>and knees at 90° Flexion and shoulders in 90° Flexion. The child's hands should be flat on the floor and facing slightly inwards. The child's elbows should not be locked in hyperextension.</p> <p>Administration:</p> <p>a. The examiner asks the child to put their left hand (touches their left hand) on their left hip (touches left hip). The examiner then asks them to lift their opposite right leg (touches their right leg). The examiner asks them to hold this position.</p> <p>b. The examiner then says, "let me turn your head". The examiner moves the child's head to their left side. The instructions are repeated to the other side.</p>	<p>should be given another two chances to assume the position. The child's best attempt should be recorded. Once the child's upper and lower limbs touch the ground the examiner stops the stop watch.</p> <p>Grading:</p> <p>1 = Holds position between 0 and 1 seconds 2 = Holds position between 1 and 5 seconds 3 = Holds position between 5 and 10 seconds 4 = Holds position between 10 and 20 seconds 5 = Holds position for more than 20 seconds with no SNH parameters</p>
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Positioning:
Same as above

Equipment:



A Stop watch


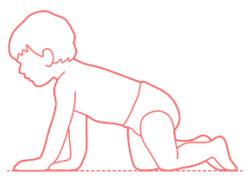
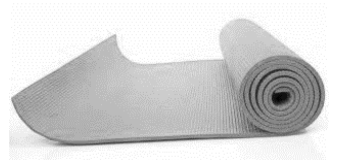


A Yoga Mat

2. Symmetrical Tonic Neck Reflex (STNR)

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> <input type="checkbox"/> A Mat <p>Description: This subtest measures the degree to which the STNR is integrated. The STNR is a brainstem reflex that is its strongest at 6-8 months and begins to disappear thereafter.</p>	<p>Positioning: The examiner asks the child to get on all fours like a dog. The examiner demonstrates the position. The child is expected to assume the four-point-kneeling position: Hips and knees at 90° Flexion and shoulders in 90° Flexion. The child's hands should be flat on the floor and facing slightly inwards. The child's elbows should not be locked in hyperextension. Examiner sits in front of the child. Examiner holds the child's head firmly, with both hands on the child's cheeks.</p>	<p>Scoring: The examiner notes any changes in the child's joint position in head flexion and then in head extension.</p> <p>Grading:</p>

<p>Time Taken: This item should take approximately 5 minutes to complete.</p>	<p>Administration:</p> <ol style="list-style-type: none"> The examiner says, “<i>let me move your head</i>”. The examiner moves the child’s head in extension. The examiner should hold the child’s head for a few seconds before letting go of the child’s head. The examiner says hold. The examiner then notes any changes in the child’s joint position. Move the child’s head to a neutral position and wait a few seconds. Move the child’s head into flexion. The examiner should hold the child’s head for a few seconds before letting go of the child’s head. The examiner says hold. The examiner then notes any changes in the child’s joint position. <p>Precaution: When the child assumes the starting position (four-point-kneeling), it is important to ensure that the child’s elbows should not be locked in hyperextension</p>	<p>1= Unable to maintain a four-point kneeling position. Goes onto bum in head extension. Change position of back, elbows and hips.</p> <p>2= Spontaneous straightening of the arms in head extension and significant and notable flexion of the elbows in Head Flexion.</p> <p>3= Slight Elbow movement, hip movement and or movement of the spine.</p> <p>4= Shaking of one or two arms. No or little trunk</p> <p>5= No change in Joint position movement.</p>
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<p>Positioning:</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Examiner</p> </div> <div style="text-align: center;">  <p>Child in Four Point Kneeling</p> </div> </div>	<p>Equipment:</p> <div style="text-align: center;">  <p>A Yoga Mat</p> </div>
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3. Bilateral ball hitting		
Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> <input type="checkbox"/> A firm 10cm ball 	<p>Positioning: The child should be seated with their legs crossed, on the mat. The examiner says, “<i>watch me</i>” and demonstrates</p>	<p>Scoring: If the child does not initially understand the instructions the child should be given a second chance</p>

- A stocking
- A 10cm foil roll

Description: This subtest evaluates the child's ability to cross the midline.

Time Taken: This item should take approximately 5-8 minutes

the positioning. The Ball should hang at shoulder height of the child.

Administration:

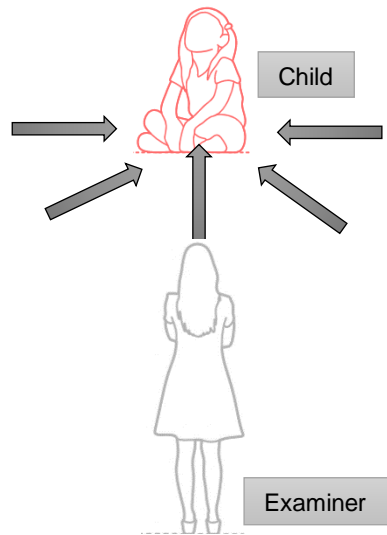
- a. The examiner says to the child, *I am going to swing this ball. I then want you to hit the ball with the foil roll, using both hands.*
- b. The examiner then says to the child, *"ready steady go"* and swings the ball. A child is given two attempts to hit the ball. The child is expected to hit the ball in different directions, namely
 - Directly in front of them (at their midline)
 - 45° from their midline, on the left and right sides of their body.
 - 90° from their midline, on the left and right sides of their body.

to hit the ball in the different planes. The child is scored based on the number of SNH parameters they demonstrate in the subtest.

Grading

- 1= Hits the ball in all four planes, Shifts bum more than 60 degrees
- 2= Hits the ball in all four planes, Shifts bum between 31-60 degrees
- 3= Able to hit the ball in all four planes, shifts between 10-30 degrees
- 4= Able to hit the ball in all four planes, shifts only 5 degrees
- 5= Able to hit the ball in all planes without shifting bum

Positioning:



Equipment



A firm 10cm ball, hanging in stocking



A foil roll inner

4. Tactile Touch Accuracy

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> □ A shield <p>Description: This subtest measures the child's ability to identify parts of their body, with the elimination of visual input.</p> <p>Time Taken: This item should take approximately 5 minutes to complete.</p>	<p>Positioning: The child should be seated with their legs crossed on the mat. The examiner, <i>says watch</i> me and demonstrates the positioning. The examiner is seated parallel to the child on the mat.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner says to the child, <i>I am going to cover your arms, do not peep</i>" The examiner then covers both the child's arms with a shield. b. The examiner asks the child to identify different places on their dominant forearm and hand. The child is expected to identify the following body parts: <ul style="list-style-type: none"> – Index Finger – Forearm – Thumb – Dorsal aspect of forearm c. The examiner places their index finger on a position on the child's body. The examiner waits for five seconds and asks the child, <i>where do you think my finger is on your body</i>. The child is then expected to touch their hand on the same position where the examiner has placed their finger. d. Once the child has identified all their body parts the examiner removes the shield. 	<p>Scoring: The examiner records the number of body parts the child is able to identify.</p> <p>Grading:</p> <ul style="list-style-type: none"> 1= Unable to identify any body parts. 2= Identifies 1 body part. 3= Identifies 2-3 body parts. 4= Able to identify all four body parts. May have a slight delay when identifying body parts. 5= Quickly identifies all four body parts.

Positioning:



Equipment:



A laminated A3 Page

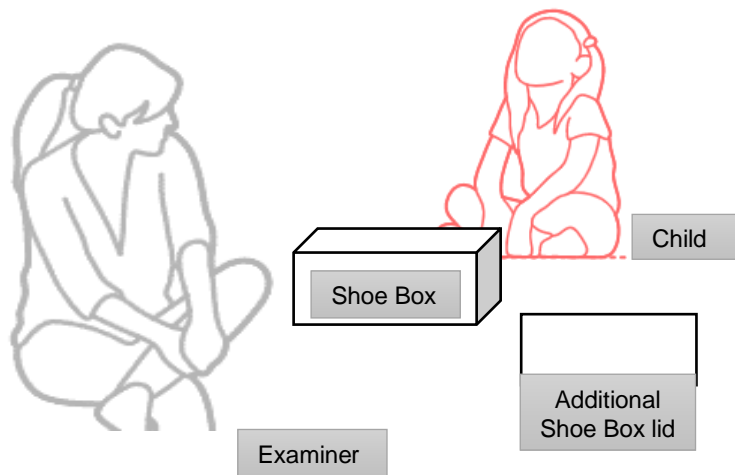
5. Tactile Perception

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> <input type="checkbox"/> A mat <input type="checkbox"/> A Shoebox <input type="checkbox"/> 3D Objects: <ul style="list-style-type: none"> – 2x wine corks – 2x keys – 2x 5 cent coins – 2x pegs – 2x tennis balls <input type="checkbox"/> 2D Objects: <ul style="list-style-type: none"> – 2x squares – 2x rectangles – 2x Ovals – 2x triangles – 2x Crosses <p>Description: The subtest measures the child's tactile discrimination through their ability to identify age specific objects and toys.</p> <p>Time Taken: This item should take approximately 7 minutes to complete.</p>	<p>Positioning:</p> <p>The child should be seated with their legs crossed, on the mat. The examiner says, “<i>watch me</i>” and demonstrates the positioning. The box should be positioned directly in front of the child. The examiner should be seated next to the child.</p> <p>3D Objects: The six 3D objects should be positioned next to the box for visual cues. Please note a strip of fabric will be inside the box to give conflicting visual stimuli.</p> <p>2D Objects: The six 3D objects should be positioned next to the box for visual cues. Please note a strip of fabric will be inside the box to give conflicting tactile stimuli.</p> <p>Administration:</p> <p>The following administration is for the 3D Objects and the 2D objects</p> <ol style="list-style-type: none"> a. The child will be expected to identify objects as follows: <ul style="list-style-type: none"> – With their right hand – With their left hand – With both hands b. <u>One hand:</u> The examiner says to the child, there are different things in this box that I want you to feel. Next to the box we have things that look like the things we are going to feel. The examiner demonstrates putting one hand inside the box, the examiner says, “<i>Now you</i> 	<p>Scoring: The examiner records the number of objects the child is able to identify. The examiner scores the 3D and 2D objects separately.</p> <p>Grading:</p> <p>1= Unable to identify any objects 2=Able to identify 1-2 objects 3=Able to identify between 3-4 objects. 4= Able to identify between 5-6 objects. Slight difficulty finding objects. 5= Able to accurately identify all 6 objects</p>

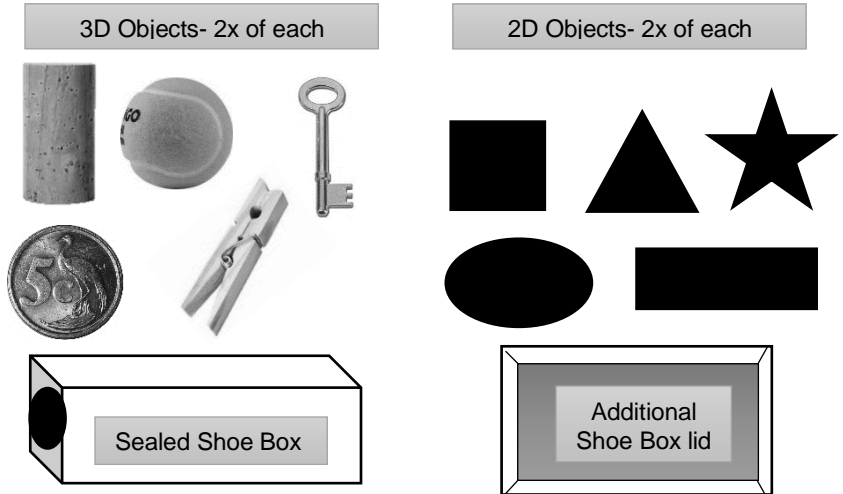
do the same". The examiner then says, "find something and feel, now point with your other hand what it is". If the child is unsure, the examiner should demonstrate and say, "watch me, now do the same". The child should only get TWO attempts per hand. After each attempt of identifying an object, the child should be asked to remove the object from the box, so that the examiner can identify whether they selected the correct object.

- c. Two hands: The examiner demonstrates putting both their hands in the box and says, "now you do the same". The examiner then says, "find something and feel, now point with a hand what it is". If the child is unsure, the examiner should demonstrate and say, "watch me, now do the same". The child is then expected to match TWO objects to the items next to the box.

Positioning:

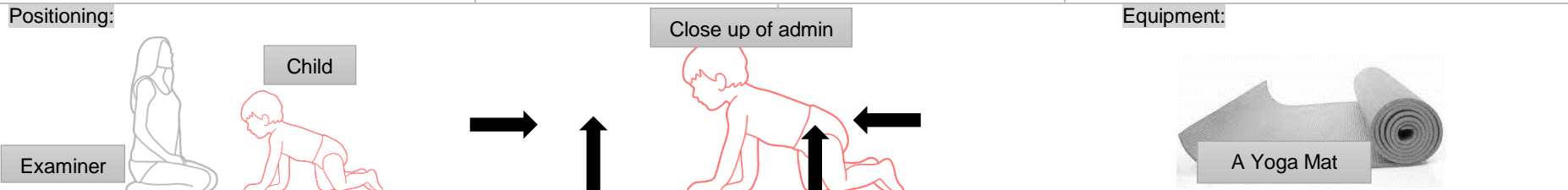


Equipment:



6. Proximal Joint Stability

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> □ A mat <p>Description: The subtest measures the child's proximal joint stability at their hips and their shoulders.</p> <p>Time Taken: This item should take approximately 5-8 minutes to complete.</p>	<p>Positioning: The child will be expected to assume a four-point kneeling: Hips and knees at 90° Flexion and shoulders in 90° Flexion. The child's hands should be flat on the floor and facing slightly inwards. The child's elbows should not be locked in hyperextension. The child will be told, "<i>let us pretend we are a lion</i>". The examiner will demonstrate the position and give the child time to move into the position.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner says to the child, "<i>Let us pretend to be strong like a lion, do not let me move you</i>". b. The examiner applies different forces on the child at different joints on their body (hips and shoulders). The forces applied are in the following directions: <ul style="list-style-type: none"> - In an anterior direction at the hips - In a posterior direction at the shoulders - The left hip and shoulder in the opposite direction - The right hip and shoulder in the opposite direction c. The examiner must note postural changes the child makes in response to different forces. 	<p>Scoring: The child should be given one extra try if it becomes clear that they do not understand the instructions given to them.</p> <p>Grading:</p> <ol style="list-style-type: none"> 1= Loses balance and falls over. Cannot perform subtest. 2= Loses balance, but is able to return to centre of gravity 3= Unable to maintain position of all four limbs. Changes in posture of joints such as the spine, shoulders and arms. 4= Maintain position of all four limbs, shifts slightly 5= Maintains position of all four limbs, no change in posture



7.Slow Movements

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Two Chairs <input type="checkbox"/> A stopwatch <p>Description: This subtest evaluates the child's ability to perform slow movements in a coordinated way.</p> <p>Time Taken: This item should take approximately 2 minutes.</p>	<p>Positioning: The child will assume a seated position. Their feet should be flat on the floor and their knees should be in 90° flexion. The child must be instructed to maintain their feet flat on the floor.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner says to the child, "<i>watch me, lets move our arms together, we must not go too fast or too slow</i>". The examiner then holds their shoulders in 90° abduction with fingertips touching their shoulders. The examiner slowly extends their elbows and then returns them to the starting position. b. The examiner slowly extends their elbows in 6-8 seconds and then returns them to the original position in 6-8 seconds. The child is expected to execute the movement simultaneously with the examiner. c. The examiner then says, "can you repeat the movement without me? At the same speed we just did?". The examiner then gives the child an opportunity to repeat the movement. The child's is then timed with a stop watch 	<p>Scoring: The hand which arrives first upon completion of slow movement, should also be noted. The child is scored based on the number of SNH parameters they demonstrate in the subtest.</p> <p>Allocation of Grade</p> <p>Grading:</p> <ol style="list-style-type: none"> 1= Completes the sequence in less than 6 seconds 2= Completes the sequence in 6-8 seconds 3= Completes the sequence in 9-11 seconds 4= Completes the sequence in 12-15 seconds 5= Completes the sequence in 16 or more seconds

Positioning:



Equipment:



A Stop watch

8. Eye Movements

Equipment, description and time taken

Equipment:

- Two Chairs
- A pencil Puppet

Description: This subtest evaluates the child's ability to establish and maintain visual contact with an object, independent eye closure, convergence, quick localisation and midline crossing.

Time Taken: This item should take approximately 5 minutes.

Positioning and Administration

Positioning: The child will be **seated** at a chair. Their feet should be flat on the floor and their knees should be in 90° flexion. The examiner should be seated at a chair, directly across from the child.

Administration:

- a. The examiner begins the assessment by assessing the child's independent eye closure. The examiner says, "*Close just one eye, now open your eyes*". The examiner then points to the other eye and says, "*Close this eye. Now open your eyes*".
- b. The examiner then holds the pencil in a vertical position and asks the child to look at the marker (puppet) on the pencil and nothing else.
- c. The examiner must instruct the child to keep their head still before beginning the different visual pursuits.
- d. **General Pursuits:** The examiner then moves the pencil in an arc 30cms from the child's face in all

Scoring

Scoring:

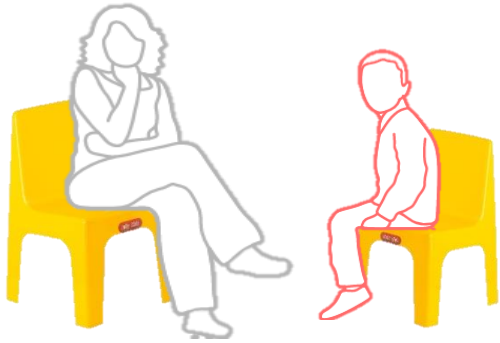

- The examiner should circle, YES if the child is able to make use of independent eye closure and NO if they are unable to make use of independent eye closure. The child's score should be recorded directly after the test.
- The child is scored based on the number of SNH parameters they demonstrate in the subtest. Each eye pursuit will be scored individually scored.

Grading:

Visual Pursuits

- 1= Unable to track without head movements. Unable to maintain focus on object.
- 2= Jerky eye movement, difficulty tracking object. May make use of head movements.

	<p>directions, namely horizontal, vertical, diagonal and circular and asks the child to follow the marker on the pencil with their eyes. Each movement should occur twice in each direction.</p> <p>e. Across Midline: The examiner then moves the pencil across the midline of the child three times, whilst both eyes are open. The examiner then asks the child to close their right eye with their right hand and moves the object across the midline three times. The examiner then asks the child to close their left eye with their left hand and moves the object across the midline three times.</p> <p>f. Convergence. The examiner moves the pencil slowly in midline with the child's nose to about 10cms away and then holds the pencil there for a few seconds.</p> <p>g. Quick Localisation: The examiner moves the pencil to different positions. Each time the pencil changes position the examiner allows the child to look at the examiners nose and then at the pencil six times.</p> <p>Precautions:</p> <ul style="list-style-type: none"> - Ensure the child's glasses are removed before beginning the subtest. - Nystagmus may be elicited in the extreme periphery in normal participants. <p>Notes: It is easier to close the non-dominant eye</p>	<p>3= The child can track the object, but makes use of head movements 2-3 times. Able to correct when mistake is identified</p> <p>4= The child can track the object, but makes use of head movements once. Easily able to correct</p> <p>5= The child can track the object without moving their head</p> <p><u>Midline Crossing:</u></p> <p>1= Severe midline jerk and inability to maintain visual tracking.</p> <p>2= Midline jerk. Needs to be refocused twice to maintain focus on the object.</p> <p>3= Midline jerk when crossing the midline. Able to refocus on object quickly</p> <p>4=Smooth Movement over the midline. Eyes may water or child may blink when crossing the midline.</p> <p>5= Smooth movement over the midline</p> <p><u>Convergence & Quick Localisation:</u> Same as Eye tracking</p>
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<p>Positioning:</p> 	<p>Equipment:</p> 
<p>Setting: As Above</p>	<p>Equipment: As Above (Excepting eye tracking pencil)</p>

9. Tongue Movements

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> □ Two Chairs <p>Description: This subtest evaluates the child's ability to coordinate movements of their tongue.</p> <p>Time Taken: This item should take approximately 2 minutes.</p>	<p>Positioning: The child will assume a seated position. Their feet should be flat on the floor and their knees should be in 90° flexion. The examiner should be seated directly across from the child.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner says to the child, "<i>I want you to look carefully at my tongue, make your tongue move the same as mine</i>". b. The examiner demonstrated different tongue movements: Up, Down, left and right. The examiner gives the child 10 seconds to react to each movement. In the final movement the child must move their tongue in a circular direction. The examiner says to the child, "<i>pretend you have peanut butter all round your lips and lick it all off</i>". If the 	<p>Scoring: The child is scored based on the number of SNH parameters they demonstrate in the subtest. Each tongue movement will be individually scored.</p> <p>Grading:</p> <ul style="list-style-type: none"> 1= Unable to perform tongue movement. 2= Difficulty performing tongue movement. Only able to perform parts of the movement. May require instructions to be repeated. 3= Jerky tongue movement. Poor integration and control. 4= Smooth Accurate Movement of tongue, some difficulty integrating movements e.g. slight head movements. 5= Smooth Accurate Movement

child does not like peanut butter use an alternative such as chocolate or Nutella.

Positioning:



Equipment:



9.2.Lip Movements

Equipment, description and time taken

Equipment:

- Two Chairs

Description: This subtest evaluates the child's ability to coordinate movements of their mouth, and make use of the buccinator and orbicularis oris muscles.

Time Taken: This item should take approximately 2 minutes.

Positioning and Administration

Positioning: The child will assume a **seated** position. Their feet should be flat on the floor and their knees should be in 90° flexion. The examiner should be seated directly across from the child.

Administration:

- a. The examiner says to the child, "*look carefully at my mouth, can you make your mouth move the same as mine and hold it like that?*".
- b. The examiner demonstrates the kissing face mouth movements and gives the child 10 seconds to react to the movement.

The examiner then says, "*look carefully at my mouth and cheeks, can you make your cheeks full of air like me and hold it like that?*".

Scoring

Scoring: The child is scored based on the number of SNH parameters they demonstrate in the subtest. Each tongue movement will be individually scored.

Grading:

- 1= Unable to execute lip movement. Unable to hold lip movement.
- 2= Tries to perform the subtest, but is only able to perform parts of the subtest. Holds less than 5 seconds.
- 3= Poor control and integration of movements. Able to hold between 5-8 seconds.
- 4= Good execution of lip movement. Slight difficulty integrating movement. Able to hold for 9-10 Seconds.
- 5= Excellent execution of lip movement. Able to hold for a duration of 10 seconds.

Positioning:



As above.

Equipment:

As above.

10. Jumping Sequence

Equipment, description and time taken	Positioning and Administration	Scoring
<p>Equipment:</p> <ul style="list-style-type: none"> □ Yellow Masking Tape to measure a distance of 4m <p>Description: This subtest evaluates the child's ability to complete a series of jumps over a distance with two feet together.</p> <p>Time Taken: This item should take approximately 5-8 minutes</p>	<p>Positioning: The child and the examiner stand parallel to one another at the beginning of the 4m masking tape demarcation.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner says to the child, "<i>today we will jump, when we jump, we must follow the yellow road in front of us</i>". b. The child will be expected to do the following sequences: <ul style="list-style-type: none"> – Jump five times – Jump hop sequence – Jump with legs open and then closed c. <u>Jump five times:</u> The examiner says, "<i>watch me jump with my two feet together</i>". The examiner demonstrates and then says, "Now do the same, start here and stop here". <u>Jump hop sequence:</u> The examiner demonstrates the jump hop sequence, hopping on their preferred leg. The examiner then says, "<i>Now you do the same, start here and stop here</i>". If necessary, the examiner can demonstrate and give the child a second chance to complete the sequence. <u>Jump with legs open and then closed:</u> The examiner demonstrates the sequence, in which they abduct their legs and then adduct their legs whilst bringing their feet together and moving forward. The examiner then says, "<i>now you do the same, start here and stop here</i>". <p>Precaution: Ensure the child has removed their shoes before beginning the activity.</p>	<p>Scoring: If the child does not initially understand the instructions the child should be given a second chance to attempt the jump hop sequence. The child is scored based on the number of SNH parameters they demonstrate in the subtest. The different jump sequences are scored separately</p> <p>Grading:</p> <p>1= Unable to perform subtest. Unable to maintain balance. Becomes easily frustrated by subtest</p> <p>2= Tries to perform the subtest, but can only perform parts of the subtest.</p> <p>3= Poor control and integration of movements. Presents with difficulty maintaining balance.</p> <p>4= Good performance of subtest. Slight difficulty integrating movements. May struggle to jump with feet together.</p> <p>5= Excellent performance of subtest. Performs integration of movements with ease.</p>

<p>Positioning</p> 		<p>Equipment:</p> 
<p>11.Ideation Challenge</p>		
<p>Equipment, description and time taken</p>	<p>Positioning and Administration</p>	<p>Scoring</p>
<p>Equipment:</p> <ul style="list-style-type: none"> <input type="checkbox"/> A 30cm by 20cm cloth <input type="checkbox"/> A stop watch <p>Description: This subtest evaluates the child's ideational praxis.</p> <p>Time Taken: This item should take approximately 6 minutes</p>	<p>Positioning: The child and the examiner are in a standing position. The examiner positions themselves directly opposite and facing the child.</p> <p>Administration:</p> <ol style="list-style-type: none"> a. The examiner says, <i>"I have a cloth, can you show me everything you can do with this cloth, you can do anything you like with it"</i>. b. The examiner starts the stopwatch the moment the child takes the cloth. The examiner times the child for a duration of 5 minutes, in which they have time to come up with as many tasks as possible. c. If a child verbally explains a task, they should be motivated to show the examiner what they can do with the cloth. d. After every 2 responses the examiner can motivate the child by saying, <i>"that is a good idea, but can you think of any more ideas?"</i>. 	<p>Scoring: If the child does not initially understand the instructions the child should be given a second chance to attempt the jump sequence. The child is scored based on the number of SNH parameters they demonstrate in the subtest. The different jump sequences are scored separately. No scoring is given for accidentally demonstrating an action.</p> <p>Grading:</p> <ul style="list-style-type: none"> 1= Cannot demonstrate any Ables 2= Can demonstrate 1-5 Ables 3= Can demonstrate between 6-8 Ables 4= Can demonstrate between 9-11 Ables 5= Can demonstrate 12 or more Ables

e. The examiner stops recording after the child is no longer able to come up with any ideas.

Positioning:



Examiner



Child

Equipment



A wash cloth

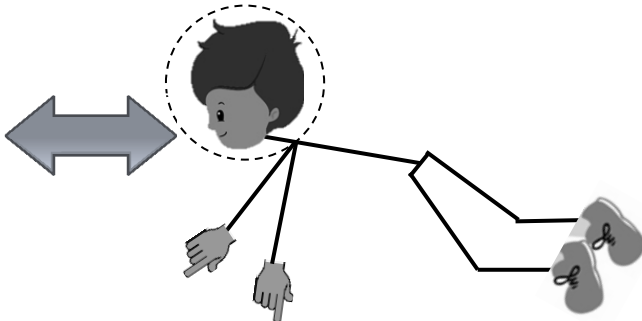


A Stop watch

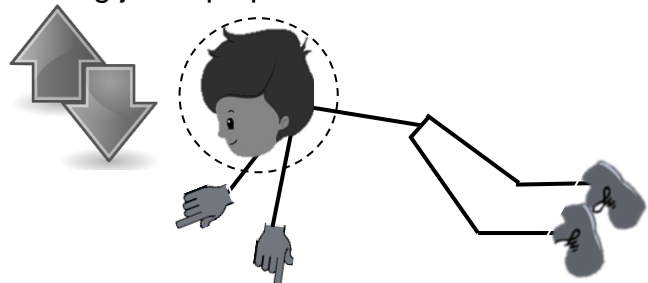
Appendix 11: Child verbal information letter and assent form in English and Afrikaans

Today we will do some activities. We will do 12 different activities. You can decide whether you want to do these activities. If at any time you don't want to play anymore you can tell me at any time and then we can stop. Let's see how you can do the following activities. / Vandag sal ons 'n paar aktiwiteite doen. Ons sal 12 verskillende aktiwiteite doen. As jy nie meer wil speel nie kan jy vir my enige tyd vertel en dan sal ons stop. Kom ons sien hoe jy die volgende aktiwiteite doen.

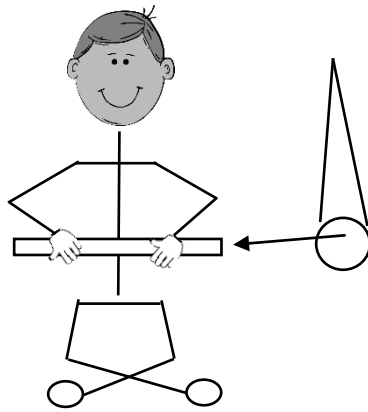
1. Move head from side to side/ Beweeg jou kop van kant tot kant



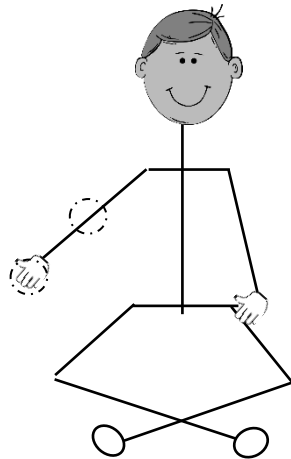
2. Move head up and down/ beweeg jou kop op en af



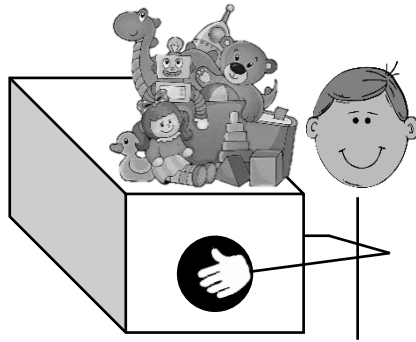
3. Hit a Ball/ slaan 'n bal



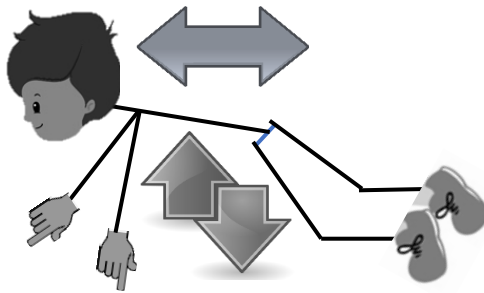
4. Pointing to places on our bodies with our eyes closed/ wys na plekke op jou lyf met jou oe toe



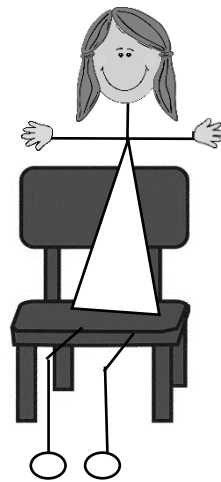
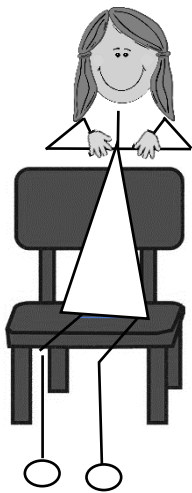
5. Finding different toys in a big box/ soek verkillende speelgoed in 'n groot boks



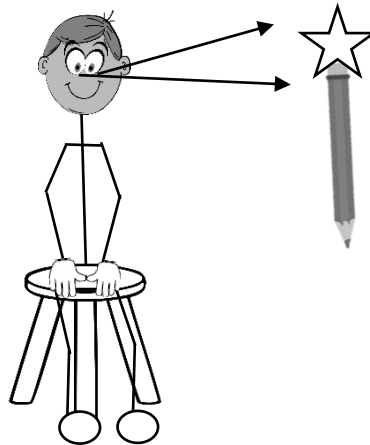
6. Let's pretend we are frozen/ Kom ons verbeel ons, ons is gevries



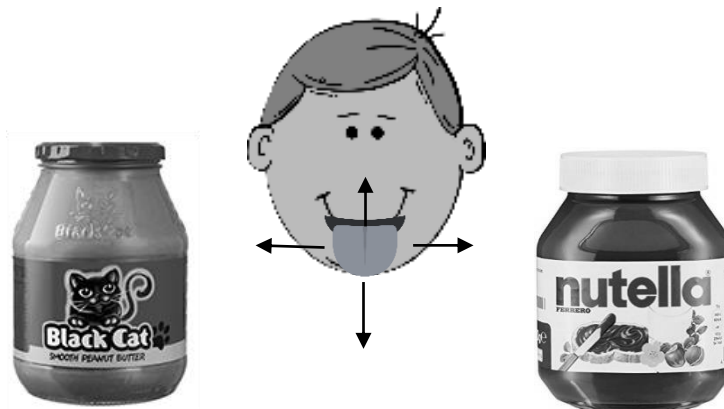
7. Move your arms slowly/ beweeg jou arms stadig



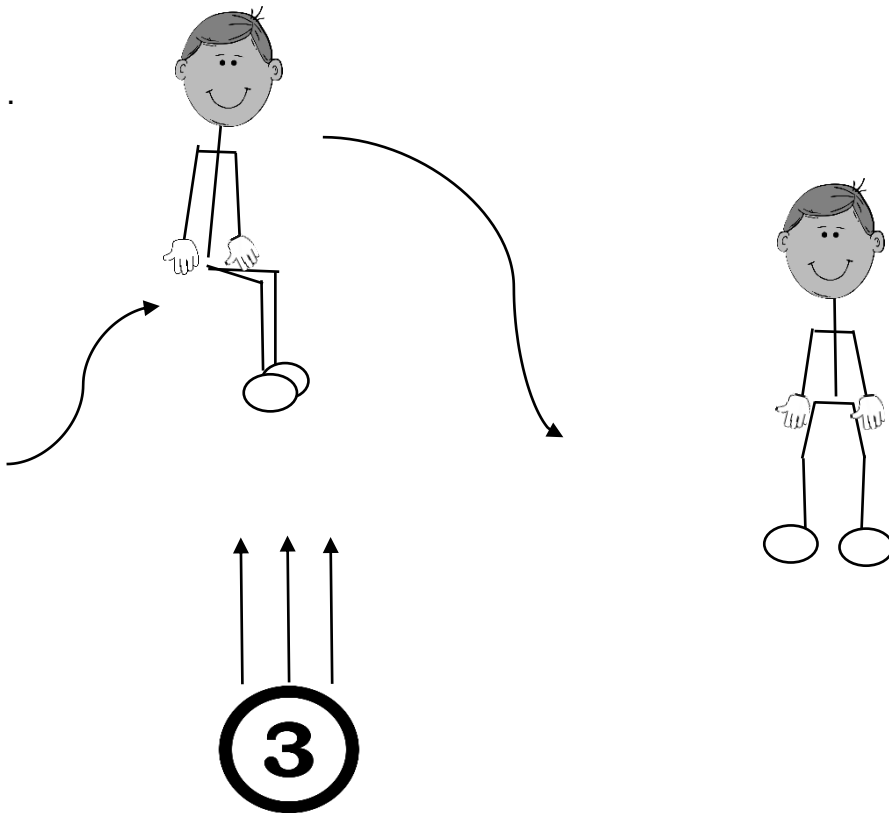
8. Following something with our eyes and keeping our head still/ volg iets met jou oë en hou jou kop stil



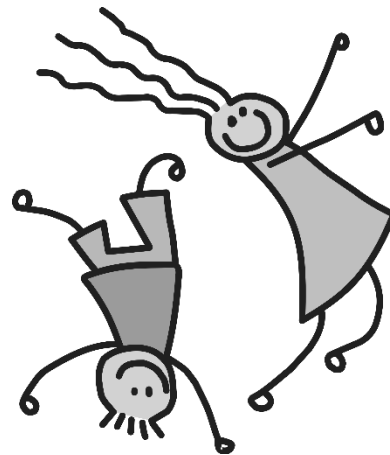
9. Pretending we are licking peanut butter off our lips/ Kom ons speel dat ons peanut butter (Grondboontjebotter) van ons lippe af lek



10. Jumping with our feet together/ spring met jou voete teen mekaar.



11. Making up a new game/ maak n' nuwe speletjie op.

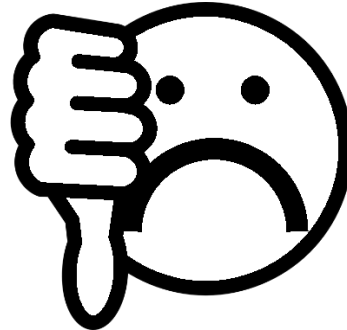


Do you mind if we make a movie of us playing? Sal jy omgee as ons 'n fliek maak van hoe ons speel?



Will you play with me? Sal jy saam met my speel?

I _____ (child's unique number) will play along and will allow a video to be taken of me. / Ek _____ (kind se unieke nommer) sal saam speel en toelaat dat 'n video van my geneem word.



Mark the face you choose with an X/ Merk die gesig wat jy kies met 'n X.

Appendix 12: Parent Feedback Form

Name: _____
Date: _____
Age of Child: _____

Dear Parent.

Upon your child's completion of the Clinical Observations, my results indicate:

- Some concern(s) with their performance of the 12 Subtests
- No concern with their performance of the 12 subtests

Please take note: The clinical observations are not a standardised assessment; thus, your child's performance in this assessment may not be a true reflection of their abilities. I have attached a list of contact numbers below, should you wish to contact an occupational therapist in the private or public sector to do a comprehensive assessment on your child. If you wish to visit a private occupational therapist it will be at your own expense or subsidised by your medical aid depending on your medical aid plan.

- | | |
|---|--|
| 1) Frere Public Hospital
043 709 2111 | Amalinda Road, Amalinda, East London |
| 2) Cecilia Makiwane Public Hospital
043 708 2111 | 4 Billie Road, Unit 4, Mdantsane |
| 3) Fryer & Cornelius, Private Practitioners
043 726 2100 | 12 Princess Road, Vincent, East London |
| 4) Janine Louw, Private Practitioner
083 233 3421 | 25 Beach Road, Nahoon, East London |
| 5) Janette Erasmus, Private Practitioner
London
083 256 9826 | 19 Pentlands Place, Beacon Bay, East |
| 6) Vanessa Ruiters, Private Practitioner
East London
072 819 2913 | 3 Fish Eagle Crescent, Beacon Bay, |


Please find attached a summary of your child's performance on the 12 subtests of the Clinical Observations. I have recorded your child's performance by highlighting items they struggled with and including their score out of five on each subtest.

Kind regards,

Elana Janse van Rensburg, B. OT (UFS)

0763960150

elanajvr@gmail.com

Signature: 

SCORING USED FOR EACH ITEM:				
1	2	3	4	5
Unable to perform the subtest	Tries to perform the subtest, but can only perform parts of the task	Performs the subtest with poor control and integration of movements	Good performance of subtest, slight difficulty experienced with the integration of movements	Excellent execution of subtest. Performs subtest with ease and easily integrates movements
DESCRIPTION OF SUBTEST:		YOUR CHILD'S SCORE:	AGE EXPECTATION FOR ITEM:	
<p>1) Asymmetrical Tonic Neck Reflex (ATNR). The child is asked to go on all fours. The therapist then moves the child's head to both sides of their body (left and right)</p> <p>2) Symmetrical Tonic Neck Reflex (STNR). The child is asked to go on all fours. The therapist then moves the child's head down and then up.</p>		<p>Score out of:</p> <ul style="list-style-type: none"> ▪ ATNR: ▪ STNR: 	<p>The ATNR and the STNR are primitive reflexes. At five years of age we usually expect these reflexes to have disappeared.</p>	
<p>3) Tactile Touch Identification. The child is expected to name different parts of their body with their eyes closed e.g. their hands and fingers.</p>		<p>Score out of 5:</p>	<p>At five years of age, we usually expect children to identify their body parts without looking.</p>	
<p>4) Tactile Perception. The child is expected to identify different toys by feeling them and not looking at them.</p>		<p>Score out of 5:</p> <ul style="list-style-type: none"> ▪ 3D objects: 	<p>At five years of age, we usually expect children to identify objects with only their sense of touch and not only their</p>	

	<ul style="list-style-type: none"> ▪ 2D objects: 	sense of sight; this is known as tactile discrimination.
<p>5) Co-contraction: In this item the child is expected to contract the muscles of their upper body and their neck in order to maintain their posture. The child is in 2-point kneeling position. The child is asked to freeze and not allow the examiner move their neck or their arms.</p>	<p>Score out of 5:</p> <ul style="list-style-type: none"> ▪ Upper limbs: ▪ Neck: 	At five years of age children, we usually expect that a child will have little control in this subtest. Five-year-old children usually experience more difficulty co-contracting the muscles of their neck than their upper limbs.
<p>6) Proximal Joint Stability: In this item the child is expected to assume a seated and 4-point kneeling position. The child is asked to freeze in this position and not let anything move them. The therapist attempts to move the child out of both positions.</p>	<p>Score out of 5:</p> <ul style="list-style-type: none"> ▪ Right Shoulders and hips: ▪ Left shoulders and hips: ▪ Forward movement at hips: ▪ Backward movement 	At five years of age, we usually expect a child to have little control in this subtest. The child may cause difficulty stabilising themselves in the 4-point kneeling position when a the examiner lightly moves their hips and shoulders.

	at shoulders:	
7) Slow Movements. The child is asked to do a movement slowly with both their arms that the therapist demonstrates.	Score out of 5:	At five years of age, we usually expect children to be able to do this movement smoothly. The correct time to complete this item is in 12 to 16 seconds.
8) Eye Tracking: The child is asked to look at a moving object. The object moves up and down, side to side and in a circular movement.	Score out of 5:	At five years of age, we usually expect children to be able to keep their head still when tracking an object with their eyes.
9) Tongue and Mouth movements. The child is expected to move their tongue in different directions, namely up and down, side to side and in a circle. The child is also expected to make a kissing face and hold air in their cheeks to test the muscles of their face.	Score out of 5: ▪ Tongue: ▪ Mouth:	At five years of age, we usually expect children to be able to move their tongue in different directions in a controlled way. A child should also be able to make a kissing face and fill their cheeks with air (this are movements that are important for speech).
10) Bilateral ball hitting. The child is asked to hit a ball in different directions and across his midline. This assessment tests whether	Score out of 5:	At five years of age, we usually expect children to plan this movement and to hit the ball accurately.

the child is able to cross their midline.		
<p>11) Jumping with feet together: The child is asked to jump with their feet together five times over a distance of 4m. The child is then asked to follow a jump hop sequence over a distance of 4m. Lastly the child is asked to complete a jumping with feet together and feet apart sequence over 4m.</p>	<p>Score out of 5: Feet together: Jump Hop: Feet together and feet apart:</p>	<p>At five years of age, we usually expect children to keep their feet together when jumping, whilst keeping their balance.</p>
<p>12) Ideation challenge. The child is given a washing cloth and asked to come up with different things to do with the washing cloth.</p>	<p>Score out of 5:</p>	<p>At five years of age, we usually expect children to use their imagination to come up with different ideas when playing with an object.</p>

Additional Comments:

Appendix 13: Phase 3- Measurement Instrument (Post Data Collection)

THE CLINICAL OBSERVATIONS						
<p>This Document was compiled by consulting the Clinical Observations by SAISI (2005), The Clinical Observations of Gross Motor Items by SAISI (2004), the Revised Clinical Observations by SAISI (2016) and telephonic interviews with Ray-Ann Cook (Co-Author of the Clinical Observations of Gross Motor Items, the Revised Clinical Observations and expert paediatric occupational therapist)</p>						
No. of Child:		_____				
DOB of Child:		_____				
Gender of Child:		F / M				
Eye Dominance:		L / R / Not established				
Hand Dominance:		L / R / Not established				
Date of Assessment:		_____/2019				
Key						
HR:	Hyperreactive Response	IA:	Inattentive Behaviour			
BIS:	Bilateral Integration & Sequencing	SNe:	Soft Neurological Sign			
E:	Emotional Reaction	LT:	Low Tone			
PC:	Postural Control	Pr:	Praxis			
V:	Vestibular	Ds:	Discrimination			
Prop:	Proprioception	T:	Tactile			
1.1. ATNR	R ATNR	1	2	3	4	5
	L ATNR	1	2	3	4	5
Degrees R Arm: _____°		Degrees L Arm: _____°				
Active, L / R differences: Yes / No						
SH Parameter	Head turned R (Passive)	Head turned L (Passive)				Code
Elbow Flexion ↓ 25°						ATNR1
No changes in joint position						ATNR2
Maintains head position						ATNR3
SNH Parameters	Head turned R (Passive)	Head turned L (Passive)				Code
Elbow flexion ↑ 25° (SNe)						ATNR4
Unable to maintain head position (SNe, PC)						ATNR5
Extension of leg on face side (SNe)						ATNR6
Moves hips over to the side (PC)						ATNR7
Loses balance (PC, V)						ATNR8
Body Swaying (PC, V)						ATNR9
Locks or fixates elbows						ATNR10
Resistance to head turning (SNe)						ATNR11
1.2. RIP	R RIP	1	2	3	4	5
	L RIP	1	2	3	4	5
R RIP: _____ Seconds		L RIP: _____				
Seconds						
SH Parameters	R RIP	L RIP				Code
Maintains head position						RIP1
Keeps leg straight						RIP2
Keeps back straight						RIP3

Leg in line with hip									RIP4
SNH Parameters	R RIP	L RIP							Code
Body swaying (PC, V)									RIP5
Unable to maintain head position (PC, SNe)									RIP6
Unable to maintain arm position (PC, SNe)									RIP7
Unable to maintain leg extended (PC, SNe)									RIP8
Curves back (PC)									RIP9
Retracts chin into shoulder (PC)									RIP10
Opens shoulders and turns body (PC)									RIP11
Loses balance (PC, V)									RIP12
Locks elbows (PC, V)									RIP13
Resistance to head turning (SNe)									RIP14
2. STNR			1	2	3	4	5		
SH Parameters	Head Flexion	Head Extension							Code
No Changes in joint position									STNR1
SNH Parameters	Head Flexion	Head Extension							Code
Unable to maintain head position (PC)									STNR2
Elbow flexion (SNe)									STNR3
Rounded back (SNe)									STNR4
Posterior pelvic tilt (SNe)									STNR5
Cannot hold position when head in flexion (SNe, PC)									STNR6
Hyperextension of elbows (SNe)									STNR7
Lordosis (SNe)									STNR8
Anterior pelvic tilt (SNe)									STNR9
Cannot hold position when head in extension, or goes onto haunches (SNe, PC)									STNR10
General Observations									
Locks Elbows (PC)									STNR11
Resistance Head Turning (SNe)									STNR12
3. Bilateral Ball Hitting		Right	1	2	3	4	5		
		Left	1	2	3	4	5		
SH Parameter	R	L							Code
Makes use of midline crossing									BBH1
General Observations									
Does not let go of foil roll (Prop, Ds)									BBH2
Elbow flexion and extension (BIS)									BBH3
Smooth Arm Movements (BIS)									BBH4
Able to follow instructions (IA)									BBH5
SNH Parameters	R	L							Code

Shifts bum and body to bring ball back into the midline (BIS)									BBH6	
General Observations										
Avoidance reaction to ball (D)									BBH7	
Let's go of foil roll (BIS)									BBH8	
Maintains elbows extended (BIS)									BBH9	
Rigid arm movements (BIS)									BBH10	
Unable to follow instructions/ requires instructions to be repeated (IA)									BBH11	
Associative reaction of mouth (SNe)									BBH12	
4. Tactile Touch Accuracy						1	2	3	4	5
Number of locations the child could point to (Dominant Arm):										
locations _____										
SH Parameters	Index Finger	Fore-arm	Thumb	Dorsal Aspect of Hand	Code					
Unable to identify location (Prop, Ds, T)					TTA1					
SNH Parameters	Index Finger	Fore-arm	Thumb	Dorsal Aspect of Hand	Code					
Inaccurate pointing to body part (Prop, Ds, T)					TTA2					
Delayed response to touch (Takes 5 seconds or more to react) (Prop, Ds, T)					TTA3					
Uses verbal prompts to try and identify body parts					TTA4					
General SNH Parameters										
Rubs or scratches on the location where the examiner touches (HR)					TTA5					
Decreased eye contact (HR/E)					TTA6					
Negative Emotional response (HR/E)	Cries / hitting / Pulled Face / Moaned Comment:				TTA7					

Refusal to participate in activity (HR/E)					TTA8					
Inattentive behaviour (IA)	Difficulty sustaining attention / Not listen when spoken to directly / does not follow instructions / resistant to complete activity / distracted by extraneous stimuli				TTA9					
Hyperactive and impulsive behaviour (HR)	Fidgets / struggles to maintain seated position / tries to get up and run or climb / talks excessively				TTA10					
5. Tactile Perception					3D Objects	1	2	3	4	5
					2D Objects	1	2	3	4	5
3D Objects					2D Objects					
L Hand:	/2				L Hand:	/2				
R Hand:	/2				R Hand:	/2				
Both Hands:	/2				Both Hands:	/2				
SH Parameter	3D Objects			2D Objects			Code			

Can listen and follow instructions							TP1	
Able to complete the entire activity							TP2	
SNH Parameters	3D Objects		2D Objects				Code	
Attempts to look inside box (Prop, T, Ds)							TP3	
Difficulty finding object in box (Prop, T, Ds)							TP4	
Tries to redo initial try/ Compensates for mistakes (Prop, T, Ds)							TP5	
General SNH Parameters							Code	
Resistant to put hand or hands in box (HR)							TP6	
Does not want to maintain hand or hands in box (HR)							TP7	
Shy to interact with activity or avoidant (HR/E)							TP8	
Appears confused by the activity							TP9	
Explosive emotions or anxiety (HR/E)							TP10	
Refusal to complete activity (HR/E)							TP11	
Associative Reaction of Mouth (SNe)							TP12	
Decreased eye contact (HR/E)							TP13	
Inattentive behaviour (IA)	Difficulty sustaining attention / not listen when spoken to directly / does not follow instructions / resistant to complete activity / distracted by extraneous stimuli/ Attempts to distract the examiner from the activity						TP14	
Hyperactive and impulsive behaviour (HR)	Fidgets / struggles to maintain seated position / tries to get up and run or climb / talks excessively						TP15	
6. Proximal Joint Stability			R Hip and ULS	1	2	3	4	5
			L Hip and ULS	1	2	3	4	5
			Anterior	1	2	3	4	5
			Posterior	1	2	3	4	5
SH Parameters	R Hip and ULS	L Hip and ULS	Anterior	Posterior			Code	
No changes in posture							PJS1	
Maintains balance							PJS2	
SNH Parameters	R Hip and ULS	L Hip and ULS	Anterior	Posterior			Code	
Joints move in the direction of force (V, Prop, PC)							PJS3	
Fixation of upper limbs (V, Prop, PC)							PJS4	
Hyperextension of elbows (LT)							PJS5	
Elbow flexion (V, Prop, PC)							PJS6	
Crossing of ankles (PC)							PJS7	
Widens base of support (PC)							PJS8	
Does not weight bear on all four limbs (PC)							PJS9	
Loses balance (V, Prop, PC)							PJS10	
Moves hips over to side (V, Prop, PC)							PJS11	

Falls back onto haunches (V, Prop, PC)									PJS12		
Lordosis (PC)									PJS13		
Rounded Back (PC)									PJS14		
7. Slow Movements						1	2	3	4	5	
The hand which arrives first:		L / R / Both									
Time without examiner:		Seconds									
SH Parameters		Seated on chair							Code		
Well controlled Shoulder movement									SM1		
Smooth and fluid movement									SM2		
Full elbow extension									SM3		
Shoulder abduction to 90°									SM4		
SNH Parameters		Seated on chair							Code		
Some left right differences (PC, Prop)									SM5		
Shoulders dropping (PC, Prop)									SM6		
Rigid arm movements (BIS)									SM7		
Did not fully extend elbows (PC, Prop)									SM8		
Did not fully abduct shoulders to 90° (PC, Prop)									SM9		
Visually monitors movement (Prop)									SM10		
Associative reactions with mouth (SNe)									SM11		
Unable to maintain feet flat on floor (PC)									SM12		
Crossing of ankles (PC)									SM13		
Widens base of support (PC)									SM14		
Slouched seated posture (PC)									SM15		
8. Eye Tracking						Visual Pursuits:	1	2	3	4	5
						Midline Crossing B:	1	2	3	4	5
						Midline Crossing R:	1	2	3	4	5
						Midline Crossing L:	1	2	3	4	5
						Convergence:	1	2	3	4	5
						Quick Localisation:	1	2	3	4	5
SH Parameter	Visual Pursuits	Midline crossing			Convergence	Quick Localisation	Code				
		B	R	L							
Visual fixation on object							EY1				
Smooth coordinated eye movements							EY2				
Eyes move independently from head							EY3				
SNH Parameter	Visual Pursuits	Midline crossing			Convergence	Quick Localisation	Code				
		B	R	L							
Difficulty fixating on object (V)		/					EY4				
Rigid movement (BIS, V)							EY5				

Loses focus when crossing the midline (BIS, V)										EY6
Makes use of head movements (V)										EY7
General SNH Parameters										
Excessive Blinking (HR)										EY8
Eyes water (HR)										EY9
Associative reaction of mouth (SNe)										EY10
Slouches in seat (PC)										EY11
9.1. Tongue and Lip Movements				Side to Side:	1	2	3	4	5	
				Up & Down:	1	2	3	4	5	
				Circular:	1	2	3	4	5	
				T. Wagging	1	2	3	4	5	
SH Parameter	Up and down		Side to side	Circular	Tongue Wagging			Code		
Accurately Completes Movement										TM1
SNH Parameter	Up and down		Side to side	Circular	Tongue Wagging			Code		
Cannot Complete Movement (BIS, Pr)	Up	Down								TM2 /TM3
Associated movement of head (Prop)										TM4
Associated movement of jaw (Prop)										TM5
Tongue jerks in corner of mouth (BIS)										TM6
Reduced speed of motion (BIS)										TM7
Jerky Movement (BIS)										TM8
General SNH Parameters										
Slouches in seat (PC)										TM9
Involuntary tongue protrusion (LT)										TM10
Dribbling (LT)										TM11
Difficulty sustaining tongue protrusion (LT, Prop)										TM12
Purses Lips (Prop)										TM13
9.2. Lip movements				Kissing Face	1	2	3	4	5	
Kissing Face: _____ Seconds				Blow up Cheeks	1	2	3	4	5	
Blow up Cheeks: _____ Seconds										
SH Parameters	Kissing Face			Blow up Cheeks					Code	
Able to assume facial expression										LM1
Able to maintain facial expression for 10 seconds										LM2
SNH Parameters	Kissing Face			Blow up Cheeks					Code	
Unable to assume facial expression (Pr, Prop)										LM3
Unable to maintain facial expression for at least 10 seconds (Prop)										LM4

Drooling/ Dribbling (LT)									LM5
Unable to push lips forward (Prop, LT)									LM6
Air escapes from lips (Prop, LT)									LM7
10. Jumping sequence in standing			Jumping sequence	1	2	3	4	5	
			Jump hop sequence	1	2	3	4	5	
			Open and close legs	1	2	3	4	5	
SH Parameter	Jumping sequence	Jump hop sequence	Open and close legs					Code	
Jumps with feet together								JS1	
Follows sequence								JS2	
Continuous movement in sequence								JS3	
Controlled stop								JS4	
SNH Parameter	Jumping sequence	Jump hop sequence	Open and close legs					Code	
Unable to maintain feet together in jump (5cm allowance) (Prop)								JS5	
Unable to accurately execute sequence (BIS, Pr)								JS6	
Maintains legs stiff/ in extension (PC)								JS7	
Starts and stops the sequence (BIS)								JS8	
Poor Rhythm (BIS)								JS9	
Cannot control stop (Prop)								JS10	
Abducts arms more than 15° (PC)								JS11	
Flexes elbows								JS12	
Poorly graded landing (Prop)								JS13	
Finishing beyond or behind the 4m marker (Prop)								JS14	
Asks or requires the examiner to repeat demonstration of sequence (I)								JS15	
Associative reactions of mouth (SNe)								JS16	
Fixates arms (PC)								JS17	
Criss Crosses legs (Prop)								JS18	
10. Ideation Challenge				1	2	3	4	5	
Number of Ables the child could identify:				_____ Ables					
Time the child stopped the activity:				_____ Minutes (Time 5 min or until un-productive)					
SH Parameter	Standing							Code	
Wash Able								IC1	
Clean Able								IC2	
Put on floor Able								IC3	
Stand on Able								IC4	

Pendulum Swing Able		IC5
Wring/ Twist Able		IC6
Pass around body Able		IC7
Fan Able		IC8
Spin in circle Able		IC9
Bite Able		IC10
Scrunch Able		IC11
Throw Able		IC12
Twirl Able		IC13
Wrap around Able		IC14
Whip Able		IC15
Stretch out between two hands Able		IC16
Hold against body Able		IC17
Jump over or on Able		IC18
Fold Able		IC19
Other Able, Specify:		IC20
<hr/>		
<hr/>		
SH Parameter	Standing	Code
Explosive emotions (E)		IC21
Shy to interact with washcloth (E)		IC22
Inattentive behaviour (IA)		IC23
Uses language to describe the activity instead of demonstrating actions (Pr)		IC24
Tries to incorporate other objects in the activity (Pr)		IC25

Appendix 14: Approval from the EC DoE



Province of the
EASTERN CAPE
EDUCATION

STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES

Steve Vukile Tshwete Complex • Zone 6 • Zwelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)40 608 4773/4035/4537 • Fax: +27 (0)40 608 4574 • Website: www.ecdoe.gov.za

Enquiries: B Pamla

Email: babalwa.pamla@ecdoe.gov.za

Date: 28 January 2019

Miss Elana Janse van Rensburg

67 Harewood Drive

Nahoon

East London

5241

Dear Ms. E Janse van Rensburg

PERMISSION TO UNDERTAKE MASTERS' THESIS: DESCRIBING THE PERFORMANCE OF FIVE-YEAR-OLD CHILDREN FROM THE BUFFALO CITY METRO ON 12 SUBTESTS OF THE REVISED CLINICAL OBSERVATIONS BY SAISI

1. Thank you for your application to conduct research.
2. Your application to conduct the above mentioned research involving Grade R Primary Schools in East London under the jurisdiction of Buffalo City Municipal District of the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:
 - a. there will be no financial implications for the Department;
 - b. institutions and respondents must not be identifiable in any way from the results of the investigation;
 - c. you seek parents' consent for minors;
 - d. it is not going to interrupt educators' time and task;
 - e. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;
 - f. you will make all the arrangements concerning your research;
 - g. the research may not be conducted during official contact time;



Ikamva eliqaqambileyo!

- h. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to Chief Director: Strategic Management Monitoring and Evaluation;
 - i. your research will be limited to those institutions for which approval has been granted, should changes be effected written permission must be obtained from the Chief Director: Strategic Management Monitoring and Evaluation;
 - j. you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis.
 - k. you present the findings to the Research Committee and/or Senior Management of the Department when and/or where necessary.
 - l. you are requested to provide the above to the Chief Director: Strategic Management Monitoring and Evaluation upon completion of your research.
 - m. you comply with all the requirements as completed in the Terms and Conditions to conduct Research in the ECDoE document duly completed by you.
 - n. you comply with your ethical undertaking (commitment form).
 - o. You submit on a six monthly basis, from the date of permission of the research, concise reports to the Chief Director: Strategic Management Monitoring and Evaluation
3. The Department reserves a right to withdraw the permission should there not be compliance to the approval letter and contract signed in the Terms and Conditions to conduct Research in the ECDoE.
 4. The Department will publish the completed Research on its website.
 5. The Department wishes you well in your undertaking. You can contact the Director, Ms. NY Kanjana on the numbers indicated in the letterhead or email nelisa.kanjana@ecdoe.gov.za should you need any assistance.



NY KANJANA
DIRECTOR: STRATEGIC PLANNING POLICY AND RESEARCH
FOR SUPERINTENDENT-GENERAL: EDUCATION

Appendix 15: Health Sciences Research Ethics Committee Approval



Health Sciences Research Ethics Committee

07-Feb-2019

Dear Ms Elana Janse Van Rensburg

Ethics Clearance: Describing the performance of five-year-old children from Buffalo City Metro on twelve subtests of the revised Clinical Observations by SAISI.

Principal Investigator: Ms Elana Janse Van Rensburg

Department: Occupational Therapy Department (Bloemfontein Campus)

APPLICATION APPROVED

Please ensure that you read the whole document

With reference to your application for ethical clearance with the Faculty of Health Sciences, I am pleased to inform you on behalf of the Health Sciences Research Ethics Committee that you have been granted ethical clearance for your project.

Your ethical clearance number, to be used in all correspondence is: **UFS-HSD2018/1451/2602**

The ethical clearance number is valid for research conducted for one year from issuance. Should you require more time to complete this research, please apply for an extension.

We request that any changes that may take place during the course of your research project be submitted to the HSREC for approval to ensure we are kept up to date with your progress and any ethical implications that may arise. This includes any serious adverse events and/or termination of the study.

A progress report should be submitted within one year of approval, and annually for long term studies. A final report should be submitted at the completion of the study.

The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services- (HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

For any questions or concerns, please feel free to contact HSREC Administration: 051-4017794/5 or email EthicsFHS@ufs.ac.za.

Thank you for submitting this proposal for ethical clearance and we wish you every success with your research.

Yours Sincerely

Dr. SM Le Grange

Chair : Health Sciences Research Ethics Committee

Health Sciences Research Ethics Committee

Office of the Dean: Health Sciences

T: +27 (0)51 401 7795/7794 | E: ethicsfhs@ufs.ac.za

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