

TREATMENTS, THERAPIES AND ACTIVITIES IN LEARNERS
WITH AUTISM SPECTRUM DISORDER AND THE EFFICACY OF
SELECTED INTERVENTIONS ON SOCIAL COMMUNICATION

BY

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**TREATMENTS, THERAPIES AND ACTIVITIES IN LEARNERS WITH AUTISM
SPECTRUM DISORDER AND THE EFFICACY OF SELECTED INTERVENTIONS ON
SOCIAL COMMUNICATION**

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**Thesis submitted for the degree *Philosophiae Doctor* in Human Movement Science
at the University of Zululand**

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December 2018

Acknowledgements

The completion of this study would not have been possible without the assistance and support of many individuals.

I would like to thank the following individuals sincerely:

I would like to express my great appreciation and thankfulness to my supervisor Dr Cornelia du Preez. You have been a remarkable mentor to me. I would like to thank you for the encouragement during this research that allowed me to grow as a researcher. Your advice on my research has been priceless.

I would also like thank my co-supervisor, Dr Sumeshni Govender. Thank you so much for your understanding and constructive advice, suggestions and comments. Your assistance in this research is greatly appreciated.

To my favorite husband love of my life, Johan Gouws, I would like to express my gratefulness for being such an amazing husband. Thank you so much for all your support and love. I appreciate all your sacrifices during this journey.

To my parents, Chris and Ansie Pienaar, thank you for your unconditional love and support. Words cannot describe how thankful I am for everything you have done and taught me.

To my family and friends, thank you for the support, prayers and love.

I would like to send an exceptional thank you to the following people:

- *The late Mr. van Soloms for your assistance in the statistical analyses of my data.*
- *Elitza Marais and her team from Able Centre and Marthie Combrink and her team from Thuthukani School for your assistance in the recruiting of participants and assistance during data collection.*

-
- *Occupational Therapist Lizl van Rooyen for all your assistance during the study.*
 - *To all the Honors students that assisted with the research study.*
 - *Dr Fawole for editing.*

Finally, I thank God for blessing me with such a great learning opportunity. I experienced your guidance every day. Thank you Lord.

Chantell Gouws

December 2018

And now we thank you, our God, and praise your glorious name

1 Chronicles 29:13

Abstract

TREATMENTS THERAPIES, INTERVENTIONS AND ACTIVITIES OF LEARNERS IN KWAZULU-NATAL DIAGNOSED WITH AUTISM SPECTRUM DISORDER AND THE EFFICACY OF INTERVENTIONS ON SOCIAL COMMUNICATION SKILLS

Despite the sensitivity of Autism Spectrum Disorder (ASD), and the fact that there is an increase worldwide as well as in South Africa, parents/guardians and learners face many challenges on a daily basis. The difficulties that many of these parents/guardians and learners' face are with social communications; social interaction; restricted and repetitive behavior patterns and interest in specific objects or topics. There are various treatments, therapies, interventions and activities available for these learners'. The objective of this study is to describe current treatments, therapies, interventions and activities utilized by learners diagnosed with ASD in the province of KwaZulu-Natal, South Africa. As well as to investigate the efficacy of interventions on the learners' social communications. The study also aimed to describe current pharmaceutical and supplement-based treatments used by learner diagnosed with ASD. The study also explored the role of a sensory integration intervention on mood, behavior and cognition of learners diagnosed with ASD. The study examines the effects of motor skill and horse riding activities on the social communication skills of learners diagnosed with ASD.

The study collected data from various schools and centers (specializing in ASD), parents/guardians of learners diagnosed with ASD. Data was obtained through three methods: 1) Pharmaceutical and Supplement-based treatment survey, 2) Sensory Integration intervention program, and 3) Motor skill and Horse Riding activity observations. No differentiation was made between race groups during the study. The pharmaceutical and supplement-based survey consisted 24 children aged 2-12 years diagnosed with ASD. The sensory integration therapy, twelve children aged 2-7 years

participated in the intervention. In the motor skill activity case study, three boys aged 6-8 years were observed in the horse riding lesson, four boys age 9-13 participated.

The results of the study identified the various treatments therapies, interventions and activities that can assist that learners diagnosed with ASD to participate in daily activities. These finding will also assist parents and tutors working with learners on a daily basis. Considering the increase in prevalence of ASD, it is very important that more education is provided on which treatment, therapy, intervention and activity suitable is for their child. Awareness raising in the media to reduce the stigma, improve understanding of ASD, encouragement for early diagnoses and encouragement take up of various interventions to address symptoms associated with ASD is also important.

Key Words: ASD, interventions, therapies, treatments, social communication skills.

Declaration

This thesis is a presentation of my original research work. Wherever contribution of others is involved, every effort is made to indicate this clearly, with due reference to the literature and acknowledgement of collaborative research and discussions. The co-authors of the articles in the thesis, Dr C. du Preez (supervisor) and Dr S. Govender (co-supervisor), hereby give permission to the candidate, Mrs. Chantell Gouws, to include the articles as part of her Ph.D. thesis. The contribution (advisory and supportive) of these co-authors was kept within reasonable limits, thereby enabling the candidate to submit the thesis for examination purposes. This thesis serves as fulfilment of the requirements for the Ph.D. degree in Human Movement Science within the Department of Human Movement Science in the Faculty of Science and Agriculture at the University of Zululand.

Mrs C Gouws

Student

Table of Contents

Acknowledgement	I
Abstract	III
Declaration	V
Table of Contents	VI
List of Appendixes	XII
List of Abbreviations	XIII
List of Tables	XV
List of Figures	XVII

Chapter 1: PROBLEM STATEMENT AND OBJECTIVE

1.1	Introduction	1
1.2	Problem Statement	4
1.3	Objectives	5
1.4	Hypothesis	6
1.5	Thesis Structure	6
1.6	References	8

***CHAPTER 2: ARTICLE 1: TREATMENTS, THERAPIES,
INTERVENTIONS AND ACTIVITIES UTILIZED BY CHILDREN
DIAGNOSED WITH AUTISM SPECTRUM DISORDER: A
SYSTEMATIC REVIEW***

Abstract	14
1. Introduction	15
2. Methods	16
2.1 Search strategy	16
2.2 Study design	17
2.3 Population	17
2.4 Intervention	17
2.5 Outcome measures	18
2.6 Search of literature	18
2.7 Data extraction and analysis	18
3. Results	18
3.1 Search results	18
3.2 Pharmaceuticals and Supplement-based Treatments	19
3.3 Sensory Integration Therapy	21
3.4 Motor Skill Activities	23
3.5 Animal-Assisted Activities	25
4. Discussion	27
4.1 Pharmaceuticals and Supplement-based Treatments	27
4.2 Sensory Integration Therapy	28
4.3 Motor Skill Activities	29

4.4	Animal-Assisted Activities	30
5.	Conclusion	31
6.	References	31

*Chapter 3: ARTICLE 2: SURVEY OF PHARMACEUTICAL
AND SUPPLEMENT-BASED TREATMENTS UTILISED IN
CHILDREN WITH AUTISM SPECTRUM DISORDER*

	Abstract	43
1.	Introduction	44
2.	Methods	45
2.1	Study design and background	45
2.2	Data collection	45
2.3	Data analysis	46
2.4	Ethical issues	46
3.	Results	46
4.	Discussion	49
5.	Conclusion	51
6.	References	51

***CHAPTER 4: ARTICLE 3: ROLE OF SENSORY INTEGRATION
THERAPY IN SENSORY PROCESSING DISORDER IN
CHILDREN WITH AUTISM SPECTRUM DISORDER (ASD)***

Abstract	56
1. Introduction	57
2. Methodology	59
2.1 Study design and Populations	59
2.2 Data collection, measurements validity and reliability	60
2.3 Data management and statistical analysis	61
3. Results	62
4. Discussion	62
5. Conclusion	63
6. References	64

***CHAPTER 5: ARTICLE 4: The effect of motor skill
activities on the social communication skills of
children diagnosed with Autism Spectrum Disorder***

Abstract	73
1. Introduction	74
2. Research Method and Design	75
2.1 Design	75
2.2 Study setting	76

2.3 Procedure	76
2.4 Observations	76
2.5 Ethical Clearance	77
3. Presenting Findings	78
3.1 Findings	78
3.2 Participant 1	78
3.3 Participant 2	78
3.4 Participant 3	79
4. Observations	79
5. Discussion	81
6. Conclusion	82
7. References	83

CHAPTER 6: Article 5: Reflection on the effect of Horse Riding Lessons on the Social communication skills of Children with Autism Spectrum Disorder

Abstract	89
1. Introduction	90
2. Research Method and Design	91
3. Ethical Considerations	92
4. Participation	93
5. Case Study	93
4.1 Arrival	94
4.2 Horse Riding Lessons	96

4.3 Breakfast	98
6. Conclusion	98
7. References	100

<p><i>CHAPTER 7: SUMMARY, CONCLUSIONS, LIMITATIONS AND FURTHER RESEARCH</i></p>

7.1 Summary	107
7.2 Conclusion	109
7.3 Limitations	113
7.4 Further Research	113
7.4.1 Recommendations for further research	113
7.4.2 Recommendations for parents/guardians and educators/ therapist	114
7.5 References	114

APPENDIXES

Appendix A: Formal Letter to Schools	119
Appendix B: Instructional letter to parents/guardians	121
Appendix C: Informed consent declaration (survey consent)	124
Appendix D: Autism pharmaceutical & supplement-based survey	126
Appendix E: Informed consent declaration (parent/guardian)	132
Appendix F: Informed consent declaration (child participation) English and Zulu	135
Appendix G: Informed consent checklist	141
Appendix H: Social communication observation sheet	144
Appendix I: Ethical Clearance Certificate	145
Appendix J: Proof of Author Guidelines and Publications	147
Appendix K: Short Sensory Profile & Sensory Processing Disorder Checklist	148

List of Abbreviations

AAI	Animal-assisted Interventions
AAS	Augmentative and Alternative Communication
ADHD	Attention Deficit Hyperactivity Disorder
ADOS	Autism Diagnostic Observation Schedule
ADR	Adverse Drug Reactions
ASD	Autism Spectrum Disorder
APA	American Psychiatric Association
BA	Barn Activity
CARS	Childhood Autism Rating Scale
CDC	Centre for Disease Control and Prevention
CNS	Central Nervous system
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, 5 th Edition
FDA	Food and Drug Administration

KZN	KwaZulu-Natal
NCS	National Curriculum Statement
PDD	Pervasive Developmental Disorder
SI	Sensory Integration
SIT	Sensory Integration Therapy
SSP	Short Sensory Profile
TR	Therapeutic Riding
THR	Therapeutic Horseback Riding

List of Tables

Chapter 2:

Table 2.1:	Search strategy (PICO criteria)	17
Table 2.2:	Inclusion criteria for identifying studies	17
Table 2.3:	Summary of Pharmaceuticals and Supplement-based treatments	19
Table 2.4:	Summary of Sensory Integration Therapy	21
Table 2.5:	Summary of Motor Skill Activities	23
Table 2.6:	Summary of Animal-Assisted Activities	25

Chapter 3:

Table 3.1:	Prevalence and type of scheduled pharmaceutical treatments utilized by learners aged 3-12 years diagnosed with autistic spectrum disorder in KwaZulu-Natal, South Africa	47
Table 3.2:	Prevalence and type of supplement-based treatments utilized by learners aged 3-12 years diagnosed with autistic spectrum disorder in KwaZulu-Natal, South Africa	48

Chapter 4:

Table 4.1:	Score Key for Shor Sensory Profile	60
------------	------------------------------------	----

Table 4.2:	4-Week Sensory Intervention Program followed by the Tutor and the Occupational Therapist	61
------------	---	----

Table 4.3:	Pre-test and post-test results	62
------------	--------------------------------	----

Chapter 5:

Table 5.1:	Summary of participant observations	79
------------	-------------------------------------	----

List of Figures

Chapter 2:

Figure 2.1: Literature search results

19

CHAPTER 1

PROBLEM STATEMENT AND OBJECTIVES

- 1.1. Introduction
 - 1.2. Problem Statement
 - 1.3. Objectives
 - 1.4. Hypothesis
 - 1.5. Thesis Structure
 - 1.6. References
-

1.1 INTRODUCTION

Autism spectrum disorder is a neurodevelopmental disability characterized by a lack of social and emotional reciprocity, limited verbal and non-verbal language skills and the presence of stereotyped and repetitive behaviors (Baird, Cass & Slonims, 2003; Cermak, Curtin, Bandini, 2010; Kirby, Boyd, Williams, Faldowski & Banarek, 2016). The prevalence of autism increased over the last several decades (Barbaresi, Katusic, Colligan, Weaver, & Jacobsen, 2005; Gernsbacher, Dissannayake, Goldsmith, Mundy, Rogers, & Sigman, 2005; Wiggins, Baio & Rice, 2006; Johnson, Myers & American Academy of Pediatrics Council on Children with Disabilities, 2007) and it is now thought to be a common neurodevelopmental disorder with estimates of 1 case per 66 individuals worldwide. It is 3 times more common in males (Insel, 2012; Centers for Disease Control and Prevention, 2014; DClinPsy, Hull & DClinPsy, 2017).

Severity ranges from severe mental disability to so-called “high functioning autism”, which describes ASD sufferers, with normal or high intelligence struggle but with social skills (Johnson & Myers, 2007). Symptoms of ASD are typically recognized during the second

year of life (12-24 months of age) but may be seen earlier than 12 months if developmental delays are severe, or noted later than 24 months if the symptoms are subtler (Ganz, Earles-Vollrath, Heath, Parker, Rispoli & Duran, 2012; Insel, 2012; American Psychiatric Association, 2013).

Despite the sensitivity of the disease and the fact that it is relatively common, there is still little understanding of its etiology. While genes have been pointed out to play a serious role in determining the risk for pervasive developmental disorders, the specifics contributing to ASD have been very difficult to describe (O’Roak & State, 2008). Early diagnosis of children with ASD is critical, but this is often postponed until they have to go to school (Mandell, Novak, & Zubritsky, 2005). Individuals diagnosed with ASD are almost unanimously delayed in the achievement of spoken language. Although rates of functional use of speech have increased in this population during the last decade (Rogers, 2006), the achievement of spoken language remains an especially important attainment for learners diagnosed with ASD. Children who do not acquire speech as a primary means of communication by school age tend to have restricted outcomes in terms of independence and integration (Howlin, 2005).

Therefore, it is important to make every attempt to induce speech in preverbal children with ASD during the preschool period in order to maximize opportunities for social interactions with family and peers and participation in mainstream settings in school and later life (Paul, Camphell, Gilbert & Tsiouri, 2013).

Parents and care givers face many issues and challenges on a day to day basis (Adams, Gouvousis, VanLue & Waldron, 2004). They are reported to have difficulties with two main areas. The first being persistent difficulties with social communication and social interaction (Adams et al., 2004). For example, they may find it hard to begin or sustain a conversation; they may not understand social rules such as how far to stand from somebody else, or they may find it difficult to make friends. The second area they have difficulty with is restricted, repetitive patterns of behavior, interests, or daily routines. For example, they may develop an overwhelming interest in something, follow inflexible routines or rituals, make repetitive body movements, or they may be hypersensitive to certain sounds.

Speech development is affected in individuals diagnosed with ASD (Mayes & Calhoun, 2003; Adams, Lockton, Freed, Gaile, McBean, Nash, Green, Vail & Law, 2012; Mody, Shui, Nowinski, Golas, Ferrone, O'Rourke and McDougle, 2017). Some may remain mute throughout their lives and only through communications – through the use of images, visual clues, sign language, or typing on a keyboard (Mayes & Calhoun, 2003). Those on the more severe end of the autism spectrum sometimes speak either using use language in unusual ways, or retaining features of earlier stages of language development for long periods, or throughout their lives. Some speak only single words, while others continuously repeat a phrase. In other instances, some repeat what they hear; a condition called echolalia (Ganz, Parker & Benson, 2009).

In milder cases on the autism spectrum, there can be problems with social interaction with peers (Watkins, Kuhn, Ledbetter-Cho, Gevarter and O'Reilly, 2017). Individuals may be bullied at school due to their distinctive behavior, interests, and impaired ability to perceive and respond in socially accepted ways to nonverbal cues. They may also be extremely literal and have difficulty interpreting and responding to sarcasm or banter.

As with many aspects of autism, early intervention is required to minimize the delays in development (Anderson & Romanczyk, 1999; Aldred & Green, 2009; Landa, 2018). There are numerous treatments, therapies and interventions designed to help people with autism. These applied behavioral analysis, drama therapy, gluten-free diet, Lego therapy, sensory integration training, snake oil, speech therapy, swimming with dolphins, horseback riding and taking supplements-based, to name but a few (Bass Duchowny & Llabre, 2009; Aitken, 2010; Sathe, Andrews, McPheeters & Warren, 2017).

Most interventions appear to produce benefits and people experiment with a variety of them. Unfortunately, in some cases these apparent benefits are short-term, insignificant or illusionary. Any benefit may be outweighed by the financial and emotional costs of the intervention, or the dangers inherent in some therapies. At present there is very little scientifically valid research into the effectiveness of most of these treatments, therapies and interventions.

1.2 PROBLEM STATEMENT

Autism seems to be on the increase worldwide, and South Africa is not left out (Louw, Bentley, Sorsdahl & Adnams, 2013). Individuals diagnosed with ASD face several challenges related to social interaction, behavior and communication. There is no recent statistics on the prevalence on ASD in South Africa. A 2009 review, detailed the prevalence rates for ASD are between 1 per 150 and 1 per 200 individuals and rates of 1 per 500 for the diagnosis of strictly defined autism (Louw, Bentley, Sorsdahl & Adnams, 2013).

The most recent statistics according to the Western Cape Education Department in 2016, is that 1, 684 learners are found on the Autism Spectrum and that only 940 of those children are attend school (learners). African children under the age of 6 are affected by autism and 10 children per week are diagnosed at Red Cross, Tygerberg and Lentegeur Psychiatric Hospitals (Autism Western Cape, 2009).

The data available from clinical case archives in large academic facilities might have gone unpublished (Kauchali, 2008; Bakare & Minur, 2011). This leaves no data on the prevalence, the causes, risk factors and treatment, therapies intervention and activity models for ASD in South Africa. Due to this misfortune, ASD has received little attention as a public priority (Kauchali, 2008).

Various treatments, therapies, interventions and activities are used worldwide to address these challenges. Little is however known about the treatments, therapies and interventions used by learners in South Africa. In addition to this there is little research evidence on the efficacy of specific interventions to address challenges related to social interaction, behavior and communication.

This research therefore attempted to partially address this problem by posing the following two research questions:

- What treatments, therapies, interventions and activities are currently utilized by learners diagnosed with Autism Spectrum Disorder in selected parts of Kwa-Zulu Natal?

-
- How effective are these treatments, therapies, interventions and activities in addressing the social communication challenges of learners diagnosed with Autism Spectrum Disorder?

1.3 OBJECTIVES

The objective of this study was to describe the current treatments, therapies, interventions and activities utilized by learners diagnosed with Autistic Spectrum Disorder in KwaZulu-Natal (KZN) and to investigate the efficacy of interventions on the social communication skills.

From this overall aim the following two specific objectives was phrased. Firstly, to describe the current treatments, therapies and interventions utilized by learners diagnosed with ASD to address ASD-related challenges, in selected schools in KZN. Additionally, to evaluate the effectiveness of various communication interventions on the social communication skills of learners aged 6 to 12 diagnosed with ASD.

1.3.1 Objective 1

The objective of this study was to provide estimates and types of medication and/or supplementation use among children with ASD in a developing country, such as South Africa.

1.3.2 Objective 2

The study explored the role of a sensory integration intervention for mood, behavior and cognition, using the Sensory Disorder checklist, in children with autism spectrum disorder and determined the timeframe within which the effects of such an intervention could be observed.

1.3.3 Objective 3

The study examined the effects of motor skill activities on the social communication skills of learners diagnosed with ASD, and evaluated their initiations and maintenance of conversations through reciprocal responses, and responses to questions and comments.

1.3.4 Objective 4

To explore the effect of horse riding lessons on the social communication skills of learners diagnosed with ASD.

1.4 HYPOTHESIS

1.4.1 Research Hypothesis 1

Sensory integration therapy improves behavior, mood and cognition of learners diagnosed with Autism Spectrum Disorder.

1.4.2 Research Hypothesis 2

Low levels of medication and/or supplementation use will be found among children with ASD in a developing country, such as South Africa.

1.5 THESIS STRUCTURE

This thesis is presented in article format as approved by the University of Zululand. consisting of seven major parts, namely and introduction (Chapter 1). It consists of seven chapters.

Chapter 1 presents the problem and states the aim and the hypothesis of this study, as well as the structure of the thesis.

Chapters 2, 3, 4, 5 and 6 presents the empirical findings of the study and are also presented as four manuscripts:

Chapter 2 - "Treatments, therapies, interventions and activities utilized by children diagnosed with Autism Spectrum Disorder: A Systematic Literature Review"

The article was submitted to the *Journal in Research in Autism Spectrum Disorder*. The journal makes is of APA reference style.

Chapter 3 - "Survey of pharmaceutical and supplement-based treatments utilised in children with Autism Spectrum Disorder"

The article was submitted to the *Annals of Global Health Journal*. The journal makes use of Chicago reference style.

Chapter 4 - “Role of Sensory Integration Therapy in Sensory Processing Disorder in Children with Autism Spectrum Disorder”.

The article is published in *HealthMED* in 2018. Vol 12 (4), (December) 2018).

The journal makes use of APA reference style. See Appendix J for proof of publication.

Chapter 5 - “The effect of motor skill activities on the social communication skills of learners diagnosed with Autism Spectrum Disorder”.

The article was submitted to the *African Journal of Disability*. The journal makes use of Harvard reference style.

Chapter 6 - “Exploring the effect of Horse Riding lessons on the Social Communication skills of learners with Autism Spectrum Disorder: A Case Study”. The article was submitted to the *African Journal of Disability*. The journal makes use of Harvard reference style.

The seventh chapter presents summary, conclusion, limitations, recommendations and further research. The chapter is followed by a list of annexures. Each chapter is followed by its references. References for Chapter 1 and 7 are according to the APA style as prescribed by the University of Zululand. The references at the end of Chapters 2 3, 4, 5 and 6 are according to the guidelines set out for authors by the specific journals and are included in the annexures.

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CHAPTER 2

Article 1:

Treatments, therapies, interventions and activities utilized by Children diagnosed with Autism Spectrum Disorder: A Systematic Review

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Treatments, therapies, interventions and activities utilized to diagnose Autism Spectrum Disorder: A Systematic Review

Gouws, C., Du Preez, C.

Abstract

Objective: The primary aim was to examine the various treatments, therapies, interventions and activities to address difficulties associated with ASD, in children diagnosed with the disorder worldwide and especially in South Africa.

Design: A systematic review.

Methods: The database of treatments, therapies, interventions and activities used by children diagnosed with ASD was compiled from MEDLINE and ERIC and in a different data basis by using the following keywords: pharmaceuticals and supplement-based treatments, sensory integrations interventions, motor skill activities and animal assisted activities.

Results: A total of 53 articles met the inclusion criteria: 12 on pharmaceuticals and supplement-based treatments, 11 on sensory integration therapies, 15 on motor skills activities and 15 on animal assisted activities. These articles were of high research quality based on the methodology and the impact factor of the journal the articles were published in.

Conclusion: Findings indicate that there are various benefits associated with treatments, therapies, interventions and activities. However, studies conducted in South Africa exploring various treatments, therapies, interventions and activities, as well as the efficacy of these are still limited.

Keywords

Pharmaceuticals, Supplement-based, Motor Skills, Sensory Integration, Animal-Assisted activities.

Introduction

Autism Spectrum Disorder (ASD) is a complex condition characterized by impairment of social communication and as well as by restricted and repetitive behavioral pattern (American Psychiatric Association, 2013; Anagnostou et al., 2015; Earl et al., 2017). Impairment of social communication can include struggling with social-emotional reciprocity, limited nonverbal means of communication, and difficulty initiating and maintaining relationships with peers (Locke, Williams, Shih & Kasari, 2016; Bauminger, Solomon & Rogers, 2010; McCormick, 2003; American-Psychiatric-Association, 2000; Gillberg & Bilstedt, 2000)

The term spectrum in this context reflects a wide variety of challenges and strengths possessed by each person with autism (Autism Speaks, 2017). ASD characteristics tend to appear between the ages of 2 and 3 years, but have been diagnosed, in some cases as early as 18 months (Bass Duchowny & Llabre, 2009). Awareness of ASD has changed significantly in recent years due to the growing number of children being diagnosed with the condition (Manning-Courtney et al., 2013).

There is an array of treatments, therapies, interventions and activities available for children diagnosed with ASD (Hyman & Levy, 2005; Levy & Hyman, 2003). Interventions can include various behavioral, cognitive, sensory integration therapies, dietary, pharmaceutical and supplement-based treatments, and motor skill and animal-assisted activities (Hyman & Levy, 2005; Levy & Hyman, 2003).

Most treatments, therapies, interventions and activities are designed to do one or more of the following: cure autism; increase adaptive behaviors, such as social skills, communication skills or imaginative behaviors; reduce or eliminate problematic behaviors such as self-harm or aggression towards others; treat co-existing conditions such as epilepsy or gastro-intestinal problems and improve or enhance the quality of life of the person with autism (Pan et al., 2009; Levy & Hyman, 2008). Lilienfeld (2012) has shown that children with autism who can speak, as well as those who have little or no functional speech all benefit from the use of unconventional communication strategies and interventions such as motor development interventions.

These treatments, therapies, interventions and activities appear to produce benefits, but their apparent benefits may be short-term, and may be outweighed by their financial and emotional costs, or by the dangers inherent to some therapies. Some treatments, therapies, interventions and activities are more promising than others (Miller, Schreck, Mullick and Butter, 2012). The ultimate goal of the above mentioned interventions are that each autistic child will be able to initiate communication

spontaneously about whatever they want, with whomever they want and in any way they desire (Lilienfield, 2012). It is already known that research in this area has become increasingly popular in recent years. However, the effectiveness of all these treatments, therapies, interventions and activities has not been tested using systematic methods, although many parents use at least one of these options before a diagnosis is even confirmed (Levy, Mandell and Merchar, 2003). Research needs to be continued on the effectiveness of these treatments to assist the parents in the choice that is best suited for their child.

Methods

Search strategy

This systematic literature review was directed and reported in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Statement (Moher, Liberati, Tetzlaff, Altman & PRISMA Group, 2009) The systematic review aimed to examine the diversity of treatments, therapies, interventions and activities by children diagnosed with ASD, and the results of these as found in previous research. A search of four databases were conducted from January 2017 to April 2018, and was replicated in June 2018: MEDLINE, ERIC, Scopus-Elsevier and Digital Dissertations. Search terms that were included are: *autism spectrum disorder, treatments, therapies, interventions, medication, supplements, sensory integration, motor skill, animal assistance*. All searches were conducted twice. Table 1 outlines the search question and key words used in the search strategy.

Identified papers were examined against inclusion criteria. All of the papers abstracts were reviewed. When it was not clear from the abstract whether the study should be included, the full text was examined when available. When there was one or more published paper on a particular topic, the most recent study was included in the review. The inclusion criteria are shown in Table 2.

Table 1. Search strategy (PICO criteria)

Definition	
Population	Children aged birth – 17 years diagnosed with ASD
Intervention	Pharmaceutical, supplement-based treatments, sensory integration interventions, motor skills and animal-assisted activities
Comparator	N/A
Outcome	Assessing treatments, therapies, interventions and activities through questionnaire or observations

Table 2. Inclusion criteria for identifying studies.

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| <ol style="list-style-type: none">1. Focused on children (boys and girls) diagnosed with ASD from birth to age 17 years.2. Initially started with a five-year period and then extended to 10 years after not finding adequate number of studies.3. Preference were given to smaller sample size.4. All South African and relevant international studies. |
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Study design

All forms of primary and secondary evidences were searched for, including systematic reviews, case studies, pilot studies, randomized control trials, controlled clinic trials and retrospective studies. Titles and abstracts of relevant articles were scanned for keywords, those titles and abstracts that did not reflect the search key words were saved for further evaluation. A secondary search using the same key words listed above was conducted on Google Scholar as well as the reference lists of selected recent articles.

Population

Studies were included for consideration if the participants were aged between birth- 17 years, of either sex and diagnosed with ASD, irrespective of the diagnostic criteria used. Experience to prior treatments, therapies, interventions and activities did not result in any exclusions of participants.

Intervention

Studies were included if the treatments, therapies, interventions and activities describing pharmaceutical and supplement-based treatments, sensory integration therapy and motor or animal-assisted activities.

Outcome measures

Studies were included if the outcome measures assessments, and identifications, determined the effectiveness and knowledge of the parents regarding treatments, therapies, interventions and activities utilized by children diagnosed with ASD.

Search of literature

A review protocol was established and the databases were searched. The results of the searches were combined, and duplicates were removed. Potential studies were identified by evaluating the title and abstract to determine their appropriateness, following the Population, Intervention,

Comparator and Outcome (PICO) criteria (as described in Table 1). The relevant studies were independently reviewed in full to determine their inclusion, based on the determined criteria and the evidence order.

Data extraction and analysis

The data extracted by the student and supervisor were collated into an excel spread sheets, included: study, location, participation description (age and sex), data collection method, objective/variable measure and key findings. Any disagreements were resolved through discussion where needed.

The collected data were compared, but due to the small number of studies and unpredictability in the outcomes measured a meta-analysis was not appropriate. Therefore, a narrative analysis was performed by the researcher and supervisor.

Results

Search results

The search strategy returned 159 total “hits” 52 of these were potentially relevant articles. After the removal of duplicates and review of full-text versions, a total of 12 articles on pharmaceutical and supplements-based treatments, 11 articles on sensory integrated therapy, 15 articles on motor skill activities, and 14 articles on animal-assisted activities were selected. The search strategy is outlined in Figure 1.

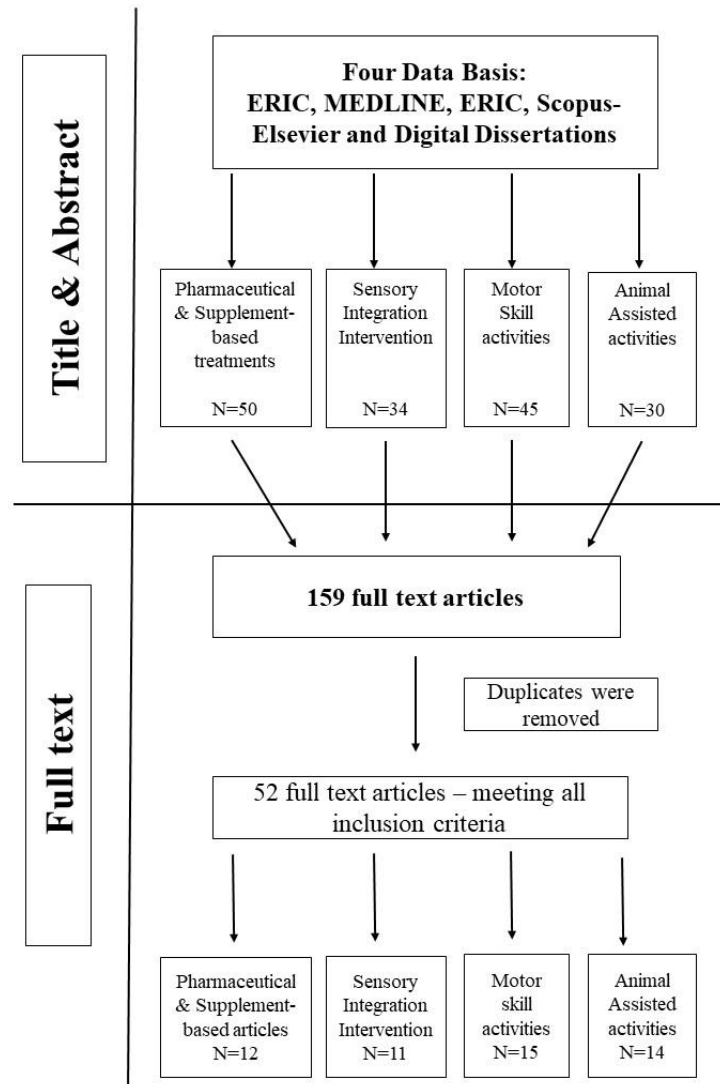


Figure 1 Literature search results.

Pharmaceutical and Supplement-based treatments

Table 3. Summary of Pharmaceutical and Supplement-based Treatments

Study			Data collection	Objectives or variables measured	Key findings
	Location	Participation Description	Method		

Silver (2017)	U.S.A.	Boys & girls age 3-20 years (sample size not indicated).	Survey	Aim to determine the effectiveness of 2 very different forms of interventions for learners with ASD.	Results indicated that both forms of treatment are effective and practical.
Wetherston et al. (2017)	South Africa	40 Mothers & 6 fathers of children age 5-9 years.	Questionnaire available in paper-based or electronic form	Investigation of the knowledge and views of parents regarding treatments for their children.	Findings should be viewed as motivation for health professionals to share information regarding the range of ASD treatments. They can assist parents in accessing appropriate facilities, recommend treatments that are supported by research, and update their knowledge on advances in ASD treatments.
Madden et al. (2017)	U.S.A.	7901 Boys & girls age 1- 17 years.	Analyzing administrative files; data on diagnoses and utilization came from claims and electronic medical record extracts.	Examined psychotropic medication use.	Weak evidence was given regarding the support.
Linke et al. (2017)	U.S.A.	49 Boys & girls age 8-17 years.	Assessments	Study tested whether functional connectivity patterns were evident, as assessed with functional magnetic resonance imaging.	Different functional connectivity patterns were identified. Results suggested that psychotropic, medications may affect functional connectivity and that medication status should be taken into consideration when studying brain functions in ASD.
Louw et al. (2013)	South Africa	65 Boys & girls age not indicated.	Questionnaire	Investigate the prevalence and patterns of medication use amongst a sample of school children and adolescents with (ASD) in the Western Cape, South Africa.	26% of the children used psychotropic medications. Children of black-colored ethnicity were less likely to uses over the counter medication than those in the white-Asian ethic groups.
Coury et al. (2012)	U.S.A.	2853 Boys & Girls aged 2-17 years.	Questionnaire	Examine rates of psychotropic medication use and identify characteristics.	Only 15% of children with no comorbid psychiatric disorder were taking psychotropic medication. Psychotropic medication use was also related to sleep and gastrointestinal problems.
Adams et al. (2011)	U.S.A.	55 Boys & girls aged 5-16 years.	Survey	An internet survey was done to identify treatments used by parents of children diagnosed with ASD.	Results suggested that the focus be on understanding the decision- making process in the treatment selection by parents.
Bowker et al. (2011)	Canada	970 parents of ASD children (age of children not indicated).	Survey	Research examined the types of treatments currently being used by parents.	The results indicated that most of the parents apply a multiple treatment approach. Parents did not continue with non-evidence based treatments when they did not observe any improvement.

Senel (2009)	Turkey	38 Boys and girls aged 0-18 months.	Survey	Survey reported the use CAM treatments, experiences, and views on each treatment.	Parents reported treatments being expensive, difficult to give to their children and harmful in some respects. The parents also viewed some treatments as a great improvement on the most difficult symptoms.
Shyu et al. (2010)	Taiwan	12 mothers & 1 father of children age 3-17 years.	Survey	Research explored explanatory models used by parents with ASD children.	The results indicated that parents chose a wide variety of treatments strategies which includes biomedical and other treatments.
Aman, et al. (2008)	U.S.A.	29 boys & 9 girls age 5-17 years.	Intervention	Research explored the effects of risperidone on the cognitive processes in children diagnosed with ASD.	There was no decline in performance with risperidone. When the drug was given there appeared to be no detrimental effect on cognitive performance.
Hanson et al. (2007)	U.S.A.	92 Boys & 20 girls age 5-10 years.	Survey	Research reported the prevalence of the use of different types of conventional, complementary and alternative therapies used by children diagnosed with ASD.	The results indicated that 74% of the families involved use complementary and alternative medicine as part of their treatment plan.

In Table 3, 12 articles on pharmaceutical and supplement-based treatments in children with ASD are summarized. The articles ranged from 2017 to 2007. Two of the articles collected data in South Africa; six in the United States of America; Canada, Turkey and Taiwan had one article each. The method for collecting data varied between seven surveys, one intervention, one assessment and one article analyzed administrative files.

Sensory Integration Therapy

Table 4. Summary of Sensory Integration Therapy.

Study			Data collection	Objectives or variables measured	Key findings
	Location	Participant Description	Method		
Anguera et al. (2017)	U.S.A.	38 Girls age 9.7-10.5 years.	Intervention	Children were tested on behavioral, neural and parental attention.	The SPD children with hyperactivity/inattention showed both improvements.
De Jager & Condy (2017)	South Africa	1 Child, age 9 years (gender not indicated).	Intervention	This case study involved understanding one unique ASD learner in order to explain the difficulty of the behavioral adjustment	This study indicated that the learner experienced executive function difficulties, and found it difficult to display the appropriate social behaviors.

				challenges he was experiencing.	
Silver (2017)	U.S.A.	Boys & girls age 3-20 years (sample size not indicated).	Intervention	The research aimed to determine the effectiveness of 2 very different forms of treatment for children with ASD.	The results indicated that both forms of treatment are effective and practical.
Lecuona, van Jaarsveld, Raubenheimer & van Heerden (2017)	South Africa	24 Premature babies (male & female).	Assessments & interventions	To investigate the effect of Ayres Sensory integration (ASI) on the development of premature babies.	Results of the studies indicated that ASI had a positive effect on the sensory development and processing of premature infants. Especially in areas of language, cognitive and motor development.
Yunus, Lui, Bisset & Penkala (2015)	Australia	132 studies.	Review	This study examined the success and ideal categories of sensory-based interventions for children with behavioral problem.	It was concluded that tactile-based interventions such as massage therapy were the most promising intervention in reducing behavioral problems. There is however the effectiveness of sensory-based interventions remains unclear.
Iwanaga, Honda et al (2014)	Japan	20 Boys & girls age 2-6 years.	Interventions	This research aimed to investigate the efficacy of sensory integration therapy for children diagnosed as displaying high functioning autism spectrum disorder.	The results indicated that sensory integration therapy might have a positive effect on motor coordination skills, non-verbal cognitive abilities and a combination of sensory motor and cognitive abilities in high-functioning ASD.
Pendergast (2014)	U.S.A.	29 Boys & girls age 18-24 months.	Interventions	The study investigated a possible relationship between sensory sensitivity and cognitive and adaptive abilities of children diagnosed with ASD.	Results showed that there were no differences in the cognitive and adaptive abilities in children who have sensory sensitivities.
De Jager & Condy (2011)	South Africa	2 Children age 5-7 years (gender not indicated).	Observations	This research aimed to explore the sensory processing difficulties of learners diagnosed with ASD.	The results confirmed that the learners have sensory processing difficulties as well as explaining the impact it has on general learning and development.
Ashburner, Ziviani, Rodger (2008)	Australia	28 Boys & girls age 6-10 years.	Observation	Children diagnosed with ASD were compared with typically developing peers on sensory processing and educational outcomes.	The results indicated that there was a pattern of auditory filtering difficulties, sensory under-responsiveness and sensory seeking that was associated with the academic underachievement of the children diagnosed with ASD.
Baker, Lane, Angley, Young (2008)	Australia	22 Boys & girls age 5 years and younger.	Intervention	Study investigated sensory processing patterns in children diagnosed with ASD.	Results indicated the presence of specific SP patterns in this sample of children and several significant relationships were found between SP

					and social, emotional and behavioral function.
Minshaw & Hobson (2008)	U.S.A.	60 Boys & girls age 17 years.	Survey	Research states that most reports of sensory symptoms are second-hand and that there is little evidence of a neurological basis.	30% of children diagnosed with ASD made a large number of errors. Both groups made few errors on the elementary sensory perception items.

Table 4 provides a summary of 11 articles of sensory integrated therapies for children diagnosed with ASD. The articles range from 2017 to 2008. Three of the studies were conducted in South Africa, four were conducted in the United States of America and the remaining three were conducted in Australia and Japan. Three of the articles had relatively small sample sizes ranging from one participant to 24.

Motor Skill Activities

Table 5. Summary of Motor Skill Activities

Study			Data collection	Objectives or variables measured	Key findings
	Location	Participation Description	Method		
Geertsema et al. (2017)	South Africa	1 Boy age 5 years and 5 months.	Intervention	The effect of different types of feedback when establishing eye contact in a child with AD.	Results suggested that knowledge or results had the greatest positive change over a short period of time regarding frequency and duration for both elected and spontaneous eye contact.
Studenka, Gillam, Hattzheim, Gillam (2017)	U.S.A.	5 Boys & girls age 8-11 years.	Intervention	Research evaluated motor perspectives as children participated in a narrative intervention program.	In the beginning the ASD children were less active, but as the intervention progressed the children displayed an increase in mental state and language use.
Rosenburg, Moran, Bart (2017)	Israel	25 Boys & girls age 2-6.5 years.	Survey	Assess the contribution of motor abilities and social communication skills to children's participation in daily activities.	The results indicated that children with low functioning ASD had a limited participation in the test.
Tryfon, Foster, Ouimet & Hyde (2017)	Canada	31 Boys aged 11 years.	Tasks	Investigate the development of auditory rhythm synchronization for the first time in ASD versus typically developed children.	Both ASD and typically developed children performed similarly on the given task.

Ketcheson, Hauck, Ulrich (2016)	U.S.A.	20 Boys & girls age 4-6 years.	Intervention	To measure the efficacy of an intensive motor skill intervention on motor skills, physical activity and socialization.	Statistical differences between experimental and control groups in all 3 motor outcomes and loco-motor skills. Findings shed light on the importance of including motor programming as part of early interventions.
Barbeau et al. (2015)	Canada	30 Boys & girls (age not indicated).	Intervention	Comparing perceptual and motor performance. Examine the association between limb movement and atypical speech development.	Findings showed that early language skills are associated with slower movement in simple as well as complex tasks.
Bremer, Balogh, Lloyd (2015)	Canada	9 Boys & girls age 4 years.	Intervention	Research was designed to investigate the efficacy of a fundamental motor skill intervention.	Experimental group improved in the object manipulation and overall motor scores. There was no change in adaptive behaviour and social skills.
MacDonald, Lord & Ulrich (2013)	U.S.A.	33 Boys & girls age 6-15 years.	Intervention	Investigate whether functional motor skills of high functioning children predict success in standardized social communication skills.	Research found that high functioning children with relatively weak motor skills have greater social communicative skills difficulties.
Potvin, Snider, Prelock et al. (2013)	U.S.A.	30 ASD & 31 Normal Developed boys & girls age 6-12 years	Intervention	This research compared the recreational engagement of high functioning autism and typically developing peers.	Study found that the 2 groups were statistically not different in personal intensity, enjoyment or preferences for recreations.
Afshari (2012)	Iran	40 Boys & girls age 7-12.5 years.	Intervention & survey	The research investigated the effect of perceptual-motor training on the attention of children diagnosed with ASD.	The results showed an increase in attention in children diagnosed with ASD, due to the impact it might have on increasing neurological and cognitive functions.
Staples & Reid (2012)	Canada	25 Boys & girls age 9-12 years.	Comparison	The fundamental movement skills of ASD children was compared with three typically developing groups.	ASD children were more impaired than would have been expected given their cognitive level.
Jasmin et al. (2009)	Canada	35 Boys & girls age 3-4 years.	Assessments	This research determined the impact of sensory-motor skills on the performance of daily living activities of children diagnosed with ASD.	The children showed atypical sensory stimuli as well as poor motor skills and daily living skills. There was also sensory avoiding and excessive reaction to sensory stimuli, and fine motor skills were highly correlated.
Pan, Tsai, Chu (2009)	Taiwan	91 (28 ASD) Boys & girls age 6-10 years	Test batteries	This research compared the movement skills of children with ASD, ADHS and TD.	Children with ASD and ADHD scored significantly lower in the TGMD; 16% had clinical.

Provost, Heimerl, Lopez (2007)	New Mexico	38 Boys & girls age 21-41 months	Test batteries	The study compared the gross and fine motor levels of ASD children.	Most of the ASD children had similar levels in gross and fine development.
Provost, Lopez, Heimerl (2007)	New Mexico	56 Boys & girls age 21-41 months	Test batteries	The study assessed motor delays in young children and compared their motor scores with typically developed children.	ASD children showed significant impairments when compared to those typically developed.

In table 5, 15 articles on motor skill activities were implemented in the treatment of children diagnosed with ASD are summarized. Most of the studies were conducted in the United States of America and Canada, with only one study done in South Africa.

Animal Assisted Activities

Table 6. Summary of Animal Assisted Activities

Study	Description of Participants		Data collection	Objectives or variables measured	Key findings
	Location	Participation Description	Method		
Becker, Rogers & Burrows (2017)	U.S.A.	31 Boys & girls age 8-14 years.	Intervention	Evaluated the effectiveness of animal-assisted social skills training for youths diagnosed with ASD.	Both groups showed improvement in theory on mind and reduced feelings of isolation and overall symptoms of depression.
Boyd & Le Roux (2017)	South Africa	12 Fathers & mothers of children age 6-18 years.	Interviews	Explore and describe parents' perceptions and experiences of THR as an activity for their children with disabilities.	THR had a positive psychological, social and physical effect on both the children participating in the riding, as well as on the parents themselves.
Harris & Williams (2017)	Edinburgh	22 Boys and 4 girls age 6-9 years.	Intervention	Case-control study on horse-riding intervention for learners with ASD.	Significant reduction in the severity of ASD symptoms and hyperactivity from pre- to post-test for the intervention group only.
Nqwena & Naidoo (2017)	South Africa	29 Boys & girls age 5- 18 years.	Intervention	Determine the effects of therapeutic horseback riding intervention on the heart rate variability (HRV) of children.	Six sessions of the intervention led to an increase in HRV.
Petty, Pan, Dechant, & Gabriels (2017)	U.S.A.	66 Boys & girls age 6-16 years.	Intervention	Examining the effects of a randomized 10-week trial therapeutic horseback riding versus a non-horse barn activity on children's behaviours with family pets.	Caregivers of THR group participants reported significant improvements in participants' caring actions with the family pet compared with barn activity.

Zachor et al. (2016)	Israel	51 Boys & girls age 4months and 3 years.	Intervention	Examined the effectiveness of an outdoor adventure program in children with ASD.	Significant improvement in social communications. Studies suggest that an outdoor adventure program may be an effective intervention.
Steiner & Kertesz (2015)	Hungary	26 Boys & girls age not indicated.	Intervention	Effect of therapeutic riding on the development of children with ASD.	There were significant differences between pre- and post-therapy in the length of the gait cycle; the children became more stable in the sagittal plane.
Garcia-Gomez et al. (2014)	Spain	16 Boys & girls age 7-14 years.	Interventions	Impact of therapeutic horse-riding program on a set of psychosocial variables.	Results showed significant differences in some of the quality-of-life indicators and there was evidence of lower levels of aggressiveness.
O'Haire (2013)	Australia	33 Boys & girls age 5.2 - 12.1 years.	Observations	Examined the interactions of children with ASD with an adult & typically developed peers in the presence of animals compared to toys.	The presence of animals could significantly increase positive behaviour among children with ASD.
Ward, Whalon, Rusnak (2013)	U.S.A.	21 Boys & girls age 8.1 years.	Intervention	Investigated the association between therapeutic riding and social communication.	Children with ASD had an increase in their social interaction, improved their sensory processing. There was a decrease in the severity of symptoms associated with ASD.
Gabriels et al. (2012)	U.S.A.	42 Boys & girls age 6- 16 years.	Intervention	Effectiveness of weekly therapeutic horseback riding lessons.	The children that participated in the THR showed a significant improvement in self-regulated behaviours.
Vanden Hout & Bragonje (2010)	U.S.A.	68 Boys and girls age 2-14 years.	Intervention	Evaluate the effectiveness of equine-assisted therapy in children with ASD.	Effects on the specific areas of functioning were all significant, the largest effects being on sociability and sensory/cognitive awareness.
Wuang, Wang, Huang & Su (2010)	Taiwan	60 Boys age 10 years.	Intervention	Effectiveness of simulated developmental horse riding program.	Children showed an improvement in motor proficiency & sensory integration functions after intervention.
Prothmann Ettrich & Prothmann (2009)	Germany	14 Boys & Girl age 11.4 years.	Intervention	Observation of ASD children when given a choice between interaction with a person, a certified therapy dog and other objects.	Findings indicated that dogs communicate their intentions in a more understanding way towards children diagnosed with ASD.

Table 6 provides a summary of 14 articles on animal-assisted activities for children diagnosed with ASD. The articles ranged from 2017 to 2009. Two of the studies were conducted in South Africa, another five in the United States of America and the remaining eight in Taiwan, Germany, Australia, Spain, Hungary, Israel, Republic of Korea and Edinburgh.

Discussion

Pharmaceutical and Supplements-based Treatments

The parents/guardians of children newly diagnosed with ASD are faced with a wide variety of pharmaceutical and supplement-based treatments that would improve their children's symptoms, cognitive and language abilities as well as health (Dawson, 2017; Frye et al., 2013, Rossignol, 2009). Despite the limited research on the effects, pharmaceutical and supplementary-based treatments are common for treating ASD (Höfer, Hoffmann and Bachman, 2017).

Wetherston et al. (2017), a study conducted in South Africa, reported on the knowledge and views parents/guardians have regarding the treatment for children diagnosed with ASD. The results indicated that more than half (53%) of the parents/guardians that participated in the study were unfamiliar with or had only heard of the treatments. Only 13.4% of the parents had a practical understanding of particular treatments. Louw et al. (2013) in a study conducted in South Africa, investigated the occurrence and patterns of pharmaceuticals used in school-going children diagnosed with ASD and found variations in the use of over the counter pharmaceuticals in different ethnic groups. Children of black or colored ethnicity were less likely to use over the counter pharmaceuticals.

The pharmaceuticals and supplement-based treatments included those for seizures, Alzheimer's, antipsychotics, complementary and alternative medicine (CAM) and attention-deficit/hyperactivity (Madden et al., 2017; Frey and Rossignol, 2014; Cauffield, 2013; Frye, Rossignol et al., 2013; Coury et al., 2012; Christon, Mackintosh and Myer, 2010). Nearly a quarter of the parents used psychotropic pharmaceuticals as part of the treatments; 40% of the children used over-the-counter complementary and alternative pharmaceuticals and 15.4% of the children followed special diets. Risperidone was one of the psychotropic pharmaceutical treatments most closely studied and is currently approved by the Food and Drug Administration (FDA). Louw et al. (2013) also found that children of black African and colored (mixed race) ethnicity were less likely to use over-the-counter pharmaceuticals than those of white and Asian ethnic backgrounds.

Studies involving pharmaceuticals have not identified any specific treatment that addresses the core symptoms of the condition, but instead focuses on the most challenging aspects of the condition such as attention deficit and distractibility, obsessive and compulsive behavior, anxiety and depression, and attempts to address one symptom at a time (Coury et al., 2012; Carlson, Brinkman and Majewicz-Hefley, 2006). Other factors contributing to the choice of pharmaceutical

can be the subject's IQ, function (social interaction with peers), and other comorbidities, but have not yet been addressed in previous studies (Coury et al., 2012).

Research indicates that these drugs are being used widely and intensively among children diagnosed with ASD (Madden et al., 2017). There is, however, currently a lack of convincing published research to support the effectiveness and the safety levels of the use of these pharmaceuticals (Madden et al., 2017).

Parents of children diagnosed with ASD may seek complementary and alternative medicine (CAM) when conventional and empirically supported treatments are ineffective or insufficient (Christon, Mackintosh, and Myers, 2010).

Children diagnosed with ASD are very sensitive to the side effects of pharmaceuticals (Cauffield, 2013). It is important to weigh the benefits against the risk of developing adverse drug reactions (ADR). Currently no pharmaceutical has received the approval of the Food and Drug Administration (FDA) of United States of America for the treatment of ASD, and the educational and behavioral intervention supports are not commonly recommended as the most appropriate first line of treatment for children diagnosed with the condition (Carlson, Brinkman and Majewicz-Helfey, 2006).

Sensory Integration Therapy

The articles investigated addressed a wide variety of research questions. The variables included auditory rhythm, fundamental motor skills, perceptual-motor skill, sensory-motor skills and gross and fine motor skills (Rosenburgh, Moran and Bart, 2017; Tryfron et al., 2017).

Therapies based on sensory integration are increasingly used by occupational therapists and sometimes by others (speech therapist, kinderkineticist and remedial teachers) in the treatment of children diagnosed with ASD (Zimmer, Desch, Rosen and Bailey, 2012). Such therapies involve activities that provide vestibular, proprioceptive, auditory and tactile input to assist the organization of the patient's sensory system (Zimmer et al., 2012).

One of the core issues managed by therapists is behavior (Smith et al., 2005). It is suggested that behavioral problems in children diagnosed with ASD are linked to the difficulty in sensory processing (Ayres, 1991). According to this thought, difficulty experiencing in sensory processing may lead to interference with school participation as well as social and daily activities (Yunus, Lui, Bisset and Penkala, 2015). An extensive literature review by Yunus et al. (2015) covered 14 studies involving 298 individuals with the majority diagnosed with ASD. Tactile, proprioceptive and vestibular sensory stimulations were described in these investigations.

In South Africa several children diagnosed with ASD attend government and private schools (De Jager and Condry, 2017). The authors explored the sensory difficulties of two Grade R children diagnosed with ASD in two schools in South Africa. According to the results both children experienced difficulty in the processing of sensations perceived through their skin, movement and vestibular. The lack of body awareness due to the experience of tactile difficulty and the insufficient understanding of body movement due to vestibular sensory difficulties may lead to the learners experiencing lack of confidence to participate in any activity involving movements. This can have a direct impact on their learning and development (De Jager and Condry, 2017; De Jager and Condry, 2011). These children are sometimes intelligent children but are often labelled as underachievers (De Jager and Condry, 2017). Lecouna et al., (2017) found that in a low socioeconomic area in South Africa, a ten-week sensory integration intervention has a positive effect on the development of premature infants.

Motor skill interventions

The role that motor skill activities play in assisting children diagnosed with ASD is frequently overlooked (Scalli, Bolling, Minio and Rice, 2015). Motor skill activities focuses mainly on the social skill development. Those diagnosed with ASD repeatedly do not participate in physical activities, leading to limited opportunities to develop their social and physical skills with their peers. Children found it difficult to communicate non-verbally through mechanisms such as facial expression, eye contact and hand gestures (Studenka, Gillam, Hartzheim and Gillam, 2017). This leads to children having difficulty planning actions (Studenka et al., 2017; Hughes, 1996). Geertsema et al., (2017) conducted research at a speech-language pathology clinic of a South African university. The results showed a positive feedback regarding eye contact during motor activities.

Motor skills activities have been shown to be beneficial for learners diagnosed with ASD (Awamleh and Woll, 2014). These motor skill activities may include improvement in a learner's mental health and mood, improvement in ability to do daily activities and improve chances of social interaction with others (Geertsema et al., 2017). One of the possibilities that have been underexplored is the effect of motor skill activities on the social communication in learners diagnosed with ASD (Rao, Beidel and Murray, 2008 Lord et al., 2000). For school going learners their social communication may include school-based or common school yard activities (Berkeley, Zittel, Pitney and Nichols, 2001; Ulrich, 2000). Motor skills deficits are common among learners

diagnosed with ASD and it may lead to them having difficulties in communication (Berkeley, et al., 2001).

Pace and Bricout (2015) concluded that after participating in motor development activity, the negative behavior of learners diagnosed with ASD decreased and the positive behavior increased. There was also an increase in the time the learners spent performing a task without losing concentration. These findings show that intervention can help with improving the communication skills of learners diagnosed with ASD.

Animal-assisted activities

Animal-assisted activities have been described as social promoters which positively influence interactions between children (Becker, Rogers and Burrows, 2017; McNicholas and Collis, 2010). Children diagnosed with ASD have been found to engage in more frequent and longer social interactions when in the presence of animals compared to that of humans or toys (Prothmann, Ettrich and Prothmann, 2009).

Globally the literature on parents' perceptions of animal-assisted activities, and their effect on children diagnosed with ASD, as well as their own personal experience of this particular activity, is very limited (Boyd and Le Roux, 2017). Animal-assisted activities for children diagnosed with ASD most commonly involve horses and dogs (Davis et al., 2015; O'Haire et al., 2013).

Animal-assisted activities are conducted in a therapeutic setting (Ward, Whalon and Rusnak, 2013; Prothmann and Fine, 2011). A study by O'Haire et al. (2013), studied small group interactions between children while in the presence of a guinea-pig and toys. When in the presence of the former, the children diagnosed with ASD showed significantly more social approach behavior than towards typically developing peers. ADS children also showed an increase in eye-contact and other positive behaviors (including laughing and smiling).

Therapeutic riding (TR) is a form of animal-assisted activity that has increased greatly in recent years (Ward et al., 2013). The use of horses in therapy has a fairly long history (Harris and Williams, 2017). Although the comparative benefits of using different species in AAI (Animal-assisted Interventions) for children diagnosed with ASD have not yet been researched (O'Haire, 2013), horses may be particularly well-suited in reducing anxiety in children (Grandin, Fine, O'Haire, Carlisle and Bowers, 2015). Therapeutic riding centers place emphasis on control, attention/focus, sensory management and communication (verbal or non-verbal) (Harris and William, 2017). TR can be particularly effective for those who experience difficulties in any of the areas mentioned above. Research by Johnson, Myers and the Council on Children with Disabilities

(2007) suggested that there was a positive response from children diagnosed with ASD in areas of communication and social interaction due to education of the parents. Bass, Duchowny and Llabre (2009) investigated the effects of TR on the social functioning of children diagnosed with ASD and found that the experimental group showed an improvement in their sensory integrations and directed attention, as well as in their social motivation, sensory sensitivity and attention (Bass, Duchowny and Llabre, 2009). Harris and Williams (2107) reported on a case-control study of a horse-riding intervention. Harris and Williams also found a significant decrease in the severity of symptoms of children diagnosed with ASD and hyperactivity from the pre-test to the post-test. Their results indicated that the intervention improved some aspects of the social functioning of children diagnosed with ASD (Harris and Williams, 2017).

The unique needs of children diagnosed with ASD have implications for animal welfare (Petty, Pan, Dechant and Gabriels, 2017). Petty et al. (2017) examined the effect of a 10-week therapeutic horseback-riding intervention (THR) versus a no-horse barn activity (BA) group of learner's behaviors with family pets. At the end of the study, caregivers noticed a significant improvement in the caring actions toward the family pet in the THR group.

CONCLUSIONS

Since there are no pharmaceuticals developed specifically to address difficulties associated with ASD, parents/guardians use a variety of prescribed and or over the counter pharmaceuticals to address symptoms related to ASD. On the other hand, some parents/guardians find pharmaceutical treatments very expensive and make the decisions not to use any pharmaceuticals.

It is important for South Africa to keep up with the international sensory integration intervention research developments. Government and private schools in South Africa should be made aware of all the characteristics of ASD (De Jager and Condy, 2011) as many of the children attending the above school are not formally diagnosed (De Jager and Condy, 2011).

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CHAPTER 3

Article 2:

Survey of pharmaceutical and supplement-based treatments utilised in children with Autism Spectrum Disorder

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Survey of pharmaceutical and supplement-based treatments utilised in children with Autism Spectrum Disorder

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Abstract

Background: Pharmaceuticals and/or supplement-based treatment use is customary among even very young children with autism spectrum disorders (ASDs) in developed countries. Despite extensive international research pertaining to the use of pharmaceuticals and supplements-based treatments, there is a limited evidence base with regards to the prevalence and, especially the type of pharmaceuticals and supplement-based use in children diagnosed with ASD in developing countries, such as South Africa due to the continued stigma associated with negative cultural beliefs and practices.

Objectives: The objective of this study was to provide estimates and types of pharmaceuticals and/or supplementation used among children with ASD in a developing country, such as South Africa.

Method: This three-month cross-sectional study used children enrolled in specialized schools in Northern KwaZulu-Natal, South Africa to examine the pharmaceutical and/or supplement-based use of 24 children aged 3-12 years with an ASD diagnosis.

Results: The five most frequently prescribed pharmaceuticals were Risperidol™ (antipsychotic; 21% of sample), Ritalin™ (central nervous system stimulant; 17%), Resperdal™ (antipsychotic; 13%), Concerta™ (central nervous system stimulant, 8%), and Strattera™ (selective norepinephrine reuptake inhibitors, 8%). In terms of vitamin/mineral supplement treatments, 38% utilised vitamin B complex, 29% an omega-3 supplement, 21% utilised BioStrath™, 17% docosahexaenoic acid, and 13% of the sample used calcium, and vitamins C and E.

Conclusion: Health care providers should be aware that a high prevalence of pharmaceutical and vitamin/mineral supplement treatment use exists among children with ASD in developing countries, despite its continued stigma and attempt should be made to understand the decision-making processes that underlie treatment selection.

Keywords: Autistic disorder, psychotropic drugs, nutritional supplements, vitamins

Introduction

Autistic spectrum disorder (ASD) is a complex disorder of neurodevelopment characterized by social interaction, communication skill, as well as behavioural and cognitive inflexibility.^{1,2} The condition is often apparent within the first three years of life.^{3,4} Associated symptoms such as hyperactivity, anxiety, aggression, insomnia and gastrointestinal (GI) disturbances are common among children with ASD and are frequently the target for treatments.⁵⁻⁷

It is essential to note that there is no known effective cure for ASD^{8,9}, and no specific pharmaceutical and supplement-based treatment that addresses the core symptoms of ASD. Instead these treatments focus on the most challenging aspects and tend to address one symptom at a time.¹⁰ In this regard, the primary objectives of pharmaceutical and supplement-based treatments are to minimize the core deficits and maximize independent social, emotional, behavioural and educational functioning and quality of life (QOL).^{10,11} Children diagnosed with ASD also utilize a variety of treatments, such as essential fatty acids (EFAs) (i.e. omega-3 fatty acids), vitamins and minerals to alleviate the side effects of the various pharmaceuticals being used.¹²

Literature provides considerable information on the variety of pharmaceutical and supplement-based treatments used in individuals with ASD in developed countries.² While estimates indicate that 35-55% of children diagnosed with ASD use psychotropic pharmaceuticals, including antipsychotics, antidepressants, and psychostimulants⁹, little or no such information exists on the estimates and types of pharmaceutical and/or supplementation use among children with ASD^{13,14}, especially in developing countries, such as South Africa. As such, this study attempted to examine the pharmaceutical and/or supplement-based use of children diagnosed with ASD.

Methods

Study design and background

This three-month cross-sectional study used children enrolled in special needs schools in northern KwaZulu-Natal, South Africa to examine their pharmaceutical and/or supplement use between May and July 2017. The study sample included 24 children (boys n=21 and girls n= 3) aged 3-12 years from various ethnic groups (White n =10, Black n=7 and Indian n=7), with an ASD diagnosis (International Classification of Diseases, Ninth Revision [ICD-9] code 299.00). KwaZulu-Natal is located in the southeast of South Africa, beside the Indian Ocean and sharing borders with the countries of Mozambique, Swaziland and Lesotho. At the 2001 census, 22.9% of KwaZulu-Natal's population aged 20 years or older had received no education with only 4.8% having received some form of higher education.

Data collection

The questionnaire was developed by the researcher. It comprised of the following sections: demographic information about the child and their family, pharmaceutical and supplement-based history. Demographic information included the age, and gender of the child and the date at which the child was diagnosed. Pharmaceutical and supplement-based history were recorded since their use influences local resources and could assist in the appropriate allotment of scarce national resources. The questionnaire was also distributed through special need schools to the parents/guardians of children diagnosed with ASD. The questionnaire was in English and where necessary assistance was provided for the completion of the questionnaire.

Data analysis

In addition to descriptive data on the type of pharmaceutical and supplement-based treatment utilized, percentages of any pharmaceutical use and/or supplement-based use were calculated for the total sample.

Ethical issues

Ethical clearance to conduct the study was granted by the University of Zululand, South Africa (UZREC 171110-030 PGD 2016/149). Permission was also obtained from the special needs schools. Participants' parents/guardians provided written informed consent prior to the children participation in the study. Data was de-identified before use to ensure anonymity. The study complied with the principles in the Declaration of Helsinki.

Results

Of the total of 150 questionnaires that were distributed to the parents or guardians during a three-month data collection period, only 24 questionnaires were included in the final analysis due as the remaining questionnaires were either not returned were/or inappropriately completed (i.e. did not include at least some demographic information). The five most frequently prescribed pharmaceuticals were RisperidolTM (antipsychotic; 21% of sample), RitalinTM (central nervous system stimulant; 17%), ResperdalTM (antipsychotic; 13%), ConcertaTM (central nervous system stimulant, 8%), and StratteraTM (selective norepinephrine reuptake inhibitor, 8%) (Table 1). Table 2 indicates the five supplement-based treatments most frequently utilized by the sampled learners age diagnosed with ASD. In this regard, 38% utilised a vitamin B complex, 29% an omega-3 supplement, 21% utilised BioStrathTM, 17% docosahexaenoic acid (DHA), and 13% of the sample used calcium, vitamin C and Vitamin E.

Table 1: Prevalence and type of scheduled pharmaceutical treatments utilized by learners aged 3-12 years diagnosed with ASD in KwaZulu-Natal, South Africa

Pharmaceutical	Daily dosage (mg)	Time of day taken	Indication	Prevalence (%)
Risperidol TM	0.5	Morning & Evening	Reduction of aggressive behaviour	21%
Ritalin TM	10 & 15	Morning	Improved concentration	17%
Resperdal TM	0.25	Morning	Reduction of anxiety	13%
Conserta TM	54	Morning	ADHD	8%
Strattera TM	40	Morning	ADHD	8%
Ability TM	5	Evening	Unknown	4%
Celebrex TM	100	Morning	Reduction of inflammation	4%
Cetirizine	10	Morning	Improved sinus congestion	4%
Consenta TM	36	Morning	ADHD	4%
Epineurin TM	2	Evening	Improved mood	4%
Ethipromine TM	30	Evening	Antidepressant	4%
Mylan-oxybutynin TM	5	Evening	Bladder control	4%
Methylphenidate TM	10	Afternoon	ADHD	4%
Rispedal TM	1	Evening	Sleep	4%

mg: milligram; ADHD: attention deficit disorder

Table 2: Prevalence and type of supplement-based treatments utilized by learners aged 3-12 years diagnosed with ASD in KwaZulu-Natal, South Africa

Type	Daily dosage	Indication	Prevalence (%)
Vitamin B Complex	25 mg	Autism	38%
Omega-3 supplement	1000 mg	Brain inflammation	29%
BioStrath™	5 ml	ADHD	21%
DHA (Omega-3 fatty acid)	50, 115 and 500 mg	Improved focus/concentration	17%
Calcium	350 mg	Did not indicate	13%
Vitamin C	333 mg	Immune support	13%
Vitamin E	1000 IU	Immune support	13%
Zinc	75 mg	Immune support, improved focus/concentration	13%
EPA (Omega-3 fatty acid)	30 & 75 mg	Improved focus/concentration	8%
Iron	10 mg	Immune support	8%
Magnesium	400 mg	Autism	8%
Vitamin B6 (Pyridoxine)	0.4 mg	Immune support	8%
Vitamin D3	250 IU	Immune support	8%
Co-enzyme Q10	150 g	Enhanced brain functioning	4%
ALA (Omega-3 fatty acid)	153 mg	Improved focus/concentration	4%
Melatonin	5 mg	Sleep	4%
Mentat™	10 ml 2x daily	Enhances memory and learning capacity	4%
Rhadiola™	1 mg	Anti-fatigue and adaptogen compound	4%
Vitamin A	1500 IU	Immune support	4%
Vitamin D3	2.5 mg	Autism	4%
Vitamin E	2.5 mg	Autism	4%
Vitamin B1 (Thiamine)	0.5 mg	Immune support	4%
Vitamin B2 (Riboflavin)	8 mg	Immune support	4%
Vitamin B3 (Niacin)	0.4 mg	Immune support	4%

Vitamin B9 (Folinic Acid)	800 mg	Improved Sleep	4%
Vitamin B12 (Cobalamin)	1.5 µg	Immune support	4%

mg: milligrams; ml: millilitres; IU: international units; g: grams; DHA: docosahexaenoic acid; ALA: α -Linolenic acid; EPA: eicosapentaenoic acid; µg: microgram.

Discussion

The objective of this study was to provide estimates and types of pharmaceutical and/or supplementation use among children with ASD in a developing country, such as South Africa. In this regard, the five most frequently prescribed pharmaceuticals in the present study were Risperidol™, Ritalin™, Risperdal™, Concerta™, and Strattera™. The findings of the present study are similar to that of a study conducted in the United States of America (USA) in that of 2,853 children surveyed in the Autism Treatment Network, 27% were used at least one psychotropic pharmaceutical.¹⁵ More specifically, use ranged from 11% in children aged three to five years to 66% in those aged 12 to 17. As with the present study, much of the use was related to co-morbid psychiatric diagnoses, including ADHD-like symptoms, bipolar disorder, obsessive-compulsive disorder, and depression. It was found that 6 children use a combination of two or more of these pharmaceutical treatments.

Risperdal™, the most commonly utilised pharmaceutical in this study, is documented to have a positive effect on reducing aggressiveness. Risperdal is a second-generation antipsychotic which was first approved by the Food and Drug Administration (FDA) in 2006 for children five years and older.¹⁴ An important consideration for the pharmaceutical, Concerta™ noted that one in four children with ADHD had an aggressive side-effect.¹⁶ This is problematic in that Handen et al. (2000)¹⁶ furthermore observed that children diagnosed with autism frequently have ADHD-like symptoms, such as distractibility, hyperactivity, excitability, and difficulty concentrating. However,

unlike in children with ADHD, those with ASD are not as responsive to stimulants and have increased sensitivity to side-effects, such as agitation.¹⁷

In terms of supplement-based treatments, the five most commonly utilized are vitamin B complex, omega-3 supplements, BioStrathTM, DHA and calcium, and vitamins C and E. The supplement-based treatments utilized by children diagnosed with ASD in this study were divided into six categories, namely; vitamins, antioxidants, nutritional supplements, minerals, gastro-intestinal supplements and other therapies. The findings of this study concur with that of Kwaika et al (2013)¹⁸ in that they propose that there is an aim on the part of parent/guardians and health care providers to supplement the nutritional deficiencies of children diagnosed with ASD with omega-3 fatty acids, probiotics, vitamins, and minerals. It is important to take note that there is limited research on the outcomes regarding the safety and efficacy of vitamin/mineral supplements being used by learners diagnosed with ASD.¹⁹ This is disconcerting given the high prevalence of supplement-based treatments being used by children in this study. However, this small sample cannot have been seen as representative of the population and generalization can thus not be made for the population.

Limitation

While the present study's sample could be construed as small, Heyde et al. (2016)²⁰. Indicate that to date studies are small and tend to involve small sample sizes. It is known that investigators have difficulty recruiting sufficient participants since not all children diagnosed with ASD use pharmaceuticals and supplements-based treatments.² In addition, such studies in South Africa have the added burden of struggling against parents/guardians denying an ASD diagnoses due to the continued stigma associated with negative cultural beliefs and practices. All of these factors make it difficult to provide estimates and types of pharmaceutical and/or supplementation used among children with ASD.

Conclusion

Health care providers should be aware that a high prevalence of pharmaceutical and supplement-based treatment use exists among children with ASD in developing countries, and may be equivalent to that of western countries, despite its continued stigma and should attempt to understand the decision-making processes that underlie treatment selection.

Conflict of interest disclosure

The authors declare that they have no competing interests.

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CHAPTER 4

Article 3:

Role of Sensory Integration Therapy in Sensory Processing Disorder in Children with Autism Spectrum Disorder (ASD)

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Manuscript published in: HealthMED Journal

See Appendix J for proof of Publication

Role of Sensory Integration Therapy in Sensory Processing Disorder in Children with Autism Spectrum Disorder (ASD)

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Abstract

Treatment of autism is still poorly understood. The condition is typically characterized by developmental disruptions in social-emotional behavior and communication. Sensory integration can be used to improve difficulties in coping with everyday activities in children with autism spectrum disorder. The study explored the role of a sensory integration intervention program, using the Sensory Disorder checklist, in children with autism spectrum disorder and determined the timeframe within which the effects of such an intervention could be observed.

The study was conducted at a special needs center in Northern KwaZulu-Natal, South Africa. Twelve children, aged 2 to 7 years were purposively sampled. A pre-test, post-test design was used to assess signs of sensory integration dysfunction in children over a 4-week period. Movement sensitivity was found to significantly improve from pre- to post-test ($p = 0.010$), while no significant changes were observed for tactile sensitivity, taste/smell sensitivity ($p = 0.9$), unresponsive sensations ($p = 0.9$), auditory filtering ($p = 0.9$) and visual/auditory sensitivity ($p = 0.9$). A strong, positive correlation was observed between behavior, mood and cognition, and movement ($R = .761$). The 4-week sensory integration intervention program positively influenced movement sensitivity. This in return can assist with mood control, cognition and overall behavior in children with autism spectrum disorder to improve the quality of caregiving and children's performance of daily activities.

Keywords: Autism Spectrum Disorder, Movement, Interventions, Sensory Integration

- At the start of the study it was unclear how Sensory Integration would change and influence children diagnosed with Autism Spectrum Disorder and the factors that might contribute to or influence these changes.
- It is now understood that with the help of an Occupational Therapist, sensory integration can positively influence movement in children diagnosed with Autism Spectrum Disorder.
- Even though the intervention program only covered a period of 4 weeks, movement was one of the areas that showed improvement.

Introduction

Autism is associated with developmental interruption in social-emotional behavior and communication (Szatmari, 2000; American Psychiatric Association, 2000; Tyfron, Foster, Ouimet, Doyle-Thomas, Anagnostu, Sharda & Hyde, 2017) African children with ASD are vulnerable to, and at risk of health issues (Zhang, Mason, Boys, Sikich & Banarek, 2016; Iannuzzi, Cheng, Broder-Fingert & Bauman, 2015). Autism was first listed as a disability with the passing of the Disabilities Education Act which was introduced in October, 1990 in the United States of America (Auxter, Pyfer & Heuttig, 2005; Roth, Zittel, Pyfer & Auxter, 2016). Numerous studies have documented that, across the spectrum of disability, individuals with autism spectrum disorder (ASD) display poor social and affective relatedness and difficulty in developing and maintaining social relationships (Fox & Riddoch, 2000; Banarek, 2002; Bundy, Lane, Murray & Fisher, 2002; American Psychiatric Association, 2000). Characteristics such as the absence of speech or an idiosyncratic way of speaking that is not part of an ideal conversation, fascination with objects, and a nervous obsessive desire for preserving the same familiar routine every day, evidence of high intelligence or skills in performing specific tasks are also some of the signs and symptoms of autism (American Psychiatric Association, 2013; Bodfish, Symons, Parker & Lewis, 2000; Leekam, Nieto, Libby, Wing & Gould, 2007; Ben-Sasson, Hen, Fluss, Cermak, Engel-Yeger & Gal, 2009; Zimmer, Desch, Rosen & Bailey, 2012; Baio, Wiggins, Christensen, Maenner, Daniels, Warran, et al, 2018).

Sensory integration (SI) is the way in which the mind stores and processes the information that is sent through to the brain during physical activity (Johnson-Ecker & Parham, 2000; Zimmer, Desch, Rosen & Bailey, 2012). Sensory, in this context, is related to sensation or to the physical senses like smell, hearing, touch, taste and vision (Johnson-Ecker & Parham, 2000; De Jager & Condy, 2011; Baio, Wiggins, Christensen, Maenner, Daniels, Warran, et al, 2018; American Psychiatric Association, 2013). Implementing SI therapy is not something new in the world of practical therapeutic methods (Lang, O'Reily, Healy, Rispoli, Lydon, Streusand, et al, 2012). Some of the earliest, as well as some of the later theories (Kashefimehr, Kayihan & Huri, 2018; Huebner & Dunn W, 2001; Iarocci & McDonald, 2006; 36; Lane & Schaaf, 2010) on autism are based on the premise that children diagnosed with the condition process sensory information differently from non-autistic children (Brock, Brown & Boucher, 2002; Just, Cherkassky, Kellar & Minshaw, 2004). Sensory integration dysfunction is relatively common among children with ASD (Banarek, Parham & Bodfish, 2005; Yunus, Lui, Bisset & Penkala, 2015; Kashefimehr, Kayihan & Huri, 2018).

Sensory integration (SI) also involves the organizing of sensory information for usage, which could come from the perception of the body and or of the surrounding world (Zimmer, Desch, Rosen & Bailey, 2012; Pfeiffer, Koenig, Kinnealey, Sheppard & Henderson, 2011; Smith, Press, Koenig & Kinnealey, 2005). Children with ASD often show different reactions in adaptable responses to sensations and specific stimuli. They may use self-stimulation to compensate for limited sensory input or to avoid overstimulation (Roger, Hepburn & Wehner, 2003; Schaaf & Nightlinger, 2007; Smith, Press, Koenig & Kinnealey, 2005; Lang, O'Reily, Healy, Rispoli, Lydon & Streusand, et al, 2012). Studies have shown that for effective perceptual-motor and cognitive functioning, sensory input stimuli must be organized so that functioning can be developed by the central nervous system (Miller & Lanne, 2000, Miller & Ozonoff, 2000). From previous research it is known that autism is caused by either abnormal brain structure, abnormal organization within the central nervous system or both (Schriber, 2012). One can use sensory integration such as physical activities and games to improve behavior, cognition and mood in children with ASD (Zimmer, Desch, Rosen & Bailey, 2012). Many educators and occupational therapists who use SI therapies daily as part of their therapeutic plan to improve behavior, cognition, and mood have witnessed changes in the children who took part in class activities such as dance, music, and drama, as well as obstacle courses. However, some children struggle to adapt to the specific tests on SI, leading the child to feel overwhelmed (Koomar, Kranowitz, Szklut, Balzer-Martin, Haber & Sava, 2001). Younger children benefit more from SI interventions because their nervous systems are developing quickly and they respond better to therapeutic interventions (Koomar, Kranowitz, Szklut, Balzer-Martin, Haber & Sava, 2001).

Although therapists and educators have tried to apply SI therapy in treating children with autism (Pfeiffer, Koenig, Kinnealey, Sheppard & Henderson, 2011; Fazilioglu & Baran, 2008), the gains have neither been scientifically researched nor have conclusive results been presented (Sniezyk, Zane & Carolyn, 2015; Case-Smith & Abresman, 2008; Watling & Rietz, 2007), necessitating the need for further research. This is especially prudent given SI's wide use (Dawson & Watling, 2000; Banarek, David, Poe, Stone & Watson, 2006; Auxter & Pyfer & Heuttig, 2005).

Despite the vast amount of research conducted in recent years on the spectrum of autistic disorders, the condition remains poorly understood in some respects (Bateman, 2013). The considerable behavioral and developmental heterogeneity, even among those individuals who fully meet the diagnostic criteria for autism, makes the search for causes and treatments extremely complex. It is

therefore imperative to develop a test protocol, as well as to determine how SI may affect behavior, cognition and mood in children with ASD, and to investigate how and whether interventions lead to effective changes. It is also important to consider in what respects there can be improvements, and whether the conditions modified are chronic or acute. The purpose of the present study reported here, was to determine whether there would be a change in the behavior, specifically cognition, and mood in children with ASD following the application of a SI intervention, and to determine to what extent SI therapy can make a difference in the short term.

Methodology

Study design and Populations

This study was quantitative in nature. It following a quasi-experimental design and a questionnaire was used to collect and record data. The main focus was to evaluate the effects of an uninterrupted 4-week sensory integration intervention program on mood, behavior and cognition in children with autism.

Twelve children of various ethnic groups between the ages of 2 and 7 years were recruited for this study. The children attend a special center for autism in a town in the KwaZulu-Natal province, South Africa. Only 12 participants were sampled since autism diagnosis rates are generally low in South Africa, and specifically in KwaZulu-Natal (Bateman, 2013) and also due to the general fear of participation in research by parents and guardians. Accurate national statistics on ASD in South Africa are hard to come by. There are only 9 specialized schools in South Africa, yet there are an estimated 135 000 children with ASD not getting specialized interventions/education (Bateman, 2013). The low level of diagnosed Autism is possibly due to the continued cultural stigma associated with having a child with Autism and the lack of health professionals to diagnose and/or care for children with ASD (De Vries, 2016, Bateman, 2013).

Informed consent was obtained from parents or guardians of children before the study commenced. To enhance familiarity, the researchers spent one-week prior to the intervention in the participants' surroundings. Thereafter, the participants were evaluated on tactile and vestibular, proprioceptive and auditory, oral and olfactory, visual, auditory-language processing dysfunction, social and emotional play and self-regulation dysfunction by their tutor. The parents/guardian were required to complete the SPD (sensory processing disorder) checklist and Short Sensory Profile (SSP) questionnaire by the tutors (Dunn, 1999) at the pre- and 4-week post-test. The SPD Checklist covers

the characteristics associated with autism, since birth to the present (Dunn, 1999). The participants were assigned a code at pre-test in lieu of identification information to limit bias throughout the study. Participants' parents/guardians provided written informed consent prior to the children participation in the study and ethical clearance to conduct the study was granted by the University of Zululand, South Africa (UZREC 171110-030 PGD 2016/149).

Data collection, measurement validity and reliability

The SPP is a 38-item questionnaire. Initial studies done by McIntosh et al (1999); Tomcheck & Dunn (2007) and Miller et al (2001) on the validity of the SSP demonstrated a discriminate validity of more than 95% in identifying children with and without sensory modulation difficulties. Together, these findings provide initial support for the use of the SSP as a valid measure of sensory processing in children with autism. Tutors were required to use the questionnaire to assess their participants' typical responses to tactile, vestibular, auditory and visual stimuli on a five-point Likert scale ranging from "never" to "always" in response to each individual stimulus (Baker, Lane, Angley & Young, 2008; Dunn, Myles & Orr, 2002; Dunn1999). Each participant took approximately 10 minutes to complete the questionnaire.

Table 1: Score key for Short Sensory Profile

Key	Description
Always	When presented with the opportunity, your child always responds in this matter, 100% of the time.
Frequently	When presented with the opportunity, your child frequently responds in this manner, about 75% of the time.
Occasionally	When presented with the opportunity, your child occasionally responds in this manner, 50% of the time.
Seldom	When presented with the opportunity, your child seldom responds in this matter, 25% of the time.
Never	When presented with the opportunity, your child never responds in this matter, 0% of the time.

The 4-week intervention program consisted of four lesson plans outlined in Table 1. Week one addressed tactile and vestibular sense. Tactile senses include input from the skin receptors about

touch, pressure, temperature, pain, and movement of the hairs on the skin. Vestibular senses include input from the inner ear about the equilibrium, gravitational changes, movement experiences, and position in space. The second week proprioceptive and auditory senses was addressed. Proprioceptive sense includes input from the muscles and joints about the bodies position, weight, pressure, stretch, movement, and changes in position in space. The third week included oral (hypersensitivity to oral input) and olfactory dysfunction (hypersensitivity to smells). Week four included visual input dysfunction (hypersensitivity to visual input) and auditory-language processing dysfunction and social, and emotional paly and self-regulation dysfunction.

Table 2: A 4-Week Sensory Intervention Program followed by the Tutors and the Occupational Therapist

Week	Area of Sensory Integration Intervention
Week 1	Lesson 1: Tactile and vestibular senses
Week 2	Lesson 2: Proprioceptive and auditory senses
Week 3	Lesson 3: Oral and olfactory dysfunction
Week 4	Lesson 4: Visual dysfunction, auditory-language processing dysfunction and social, emotional play and self-regulation dysfunction

Data management and statistical analysis

Data was analyzed using commercial software (Statistical Package for Social Sciences (SPSS) Version 20, Chicago, IL). Pre- and post-test comparisons were performed using paired t-tests. Alpha levels were set at $p \leq 0.05$ for establishing statistical significance.

The data collected in this study were interpreted using a Pearson's chi-squared test at $\alpha = 0.05$ and log linear analysis. Interpretation depends on the research question. The meaning of effect size varies by context, but the standard interpretation offered by Cohen (1988) is: 0.8 = large (8/10 of a standard deviation unit); 0.5 = moderate (1/2 of a standard deviation); 0.2 = small (1/5 of a standard deviation) (Bosco, Aquinis, Singn, Field & Pierce, 2015).

Results

In Table 2 the summarized results indicate that movement sensitivity was found to be significantly different from pre- to post-test ($p = 0.010$) (see Pair 3) with an effect size of 0.185.

Table 3: Pre-test and post-test results

Variable	Pre-test	Post-test	Significance	Effect size
Tactile sensitivity	4.26±0.56	4.38±0.57	0.438	0.222
Taste and smell	3.56±1.33	3.70±1.19	0.461	0.116
Movement	4.33±0.89	3.58±1.46	0.010*	0.185
Under responsive	3.24±0.89	3.46±0.81	0.443	0.270
Auditory	3.46±0.96	3.58±0.91	0.673	0.002
Low energy	4.33±0.65	3.90±0.83	0.293	0.317
Visual	4.12±0.56	3.82±1.09	0.250	0.030
Combination of Pre-and Post-test	3.82±0.55	3.78±0.77	0.786	-0.194

Values are means ± standard deviation

*: Indicates $p \leq 0.05$ compared to pretest

Pair 1: Tactile sensitivity; Pair 2: Taste and smell; Pair 3: Movement; Pair 4: Under responsive; Pair 5: Auditory; Pair 6: Low energy; Pair 7: Visual; Pair 8: Combination of Pre and Post-test.

Discussion

This study found that a 4-week sensory integration intervention program can small positively influence movement sensitivity in children with ASD aged 2 to 7 years, which is the most crucial age group for whom the practice of sensory integration is essential for development (Zwaigenbaum, Bauman, Stone, Yirmiya, Estes & Hansen, et al, 2015). For this reason, as it is important to practice sensory integration as early as possible in a child with ASD to ensure optimal outcomes (Samouildou & Valakova, 2006).

Previous studies reported that the behavior of children with ASD suggests that they experience difficulty with sensory integration (Bettison, 1994, Myles & Simpson, 1998; Myles & Southwick, 1999; Stagnitti, Raison & Ryan, 1999; Fling, 2000; Igwanaga, Kawasaki & Tsuchida, 2000; Attwood, 2006). Other researchers noted a link between sensory processing and the ability to cope successfully with daily life (Fisher, Murray & Bundy, 1991; Dunn, 1997; Cook & Dunn, 1998; Dunn, 1999). In this study, the researcher found a small link between sensory processing and daily activities.

Throughout the 4-week period, little or no changes were found in most of the areas that were evaluated using the SSP (Dunn, 2002; Dunn, 1999). Only movement was found to be significantly small different as a result of the intervention. This could be since other actions (touch, taste/smell, sensation seeking, auditory filtering, energy usages, and visual processing) are mainly practiced in a controlled timeframe (O'Neil & Jones, 1997; Gabriels, Cuccaro, Hill, Ivers & Goldson, 2005). Movement, however, is an inherent, continuous process, where the child is physically active whether in the classroom or at home. Movement is a part of everyday living and although sensory integration of movement is practiced once a day or sometimes more frequently (as in movement exercise) (Khodabakhshi, Abedi & Malekpour, 2014; Tomcheck & Dunn, 2007), it is still an action that is performed naturally all day long without deliberation; whether jumping, running, walking, or climbing steps. Movement occupies most of everyday living and is therefore applied more than the other areas of a child's sensory processes such as stacking, building blocks or sorting colors and shapes (Khodabakhshi, Abedi & Malekpour, 2014).

Further, movement could also have been significantly improved because it driven by a child's intellectual abilities (Green, Charman, Pickles, Chandler, Loucas, Simonof & Baird, 2009). Factors such as coordination and motor planning and control, may also influence movement (Green & Brennan, 2002; Lloyd, MacDonald & Lord, 2013).

Lack of significant improvements in the other variables could be related to the teaching environment and the short duration of the intervention. Fisher, Murray and Bundy (1991) point out that an intervention program should be no less than 6 months and can even exceed a year (Pfeiffer, Koenig, Kinnealey, Sheppard & Henderson, 2011). This makes the findings in the study sufficient as it provides evidence on improvement after only four weeks of intervention. This can also be attributed to the time it takes for a child with ASD to process information, to adapt to external changes, and to be able to perform what they have been taught.

Conclusion

A 4-week sensory integration intervention program can positively influence movement sensitivity, which assists with mood control, cognition and overall behavior in children with autism spectrum disorder thereby enabling them to cope with life more successfully. This study indicates that movement shows a better response to change over a short period of time compared to cognition and mood. But it is essential to take cognizance that cognition and mood also influence movement,

although the influence may be small (Ashburner, Ziviani & Rodger, 2008), which is similar with a small effect being found in the present study. However due to the short duration of the intervention and the small sample size, the results of the study are not generalizable.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication on this paper. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgments

The authors would like to thank the Able center for providing us with a location for conducting the research. The authors would also like to thank parents for consenting to the study as well as educators/tutors and children who participated in the research.

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CHAPTER 5

Article 4:

The effect of motor skill activities on the social communication skills of learners diagnosed with Autism Spectrum Disorder

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The effect of motor skill activities on the social communication skills of learners diagnosed with Autism Spectrum Disorder

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Abstract

Background: Children diagnosed with Autism Spectrum Disorder (ASD) face several challenges one of them being social communication. However, little is known about the effect of motor skill activities on the social communication of children diagnosed with ASD.

Objective: This study investigated the effect of motor skill activities on the social communications skills of learners diagnosed with ASD, attending a school specializing in ASD.

Methodology: A social communication observation sheet was used to record the observations of three boys between the ages of 6 and 8 years from different ethnic groups during their motor skill activities. Observations were done by the researcher over a period of eight weeks. The motor skills activities were done by the educators under supervision of an occupational therapist and kinderkineticist.

Results: The learners' social communication skills improved over the period of eight weeks.

Conclusion: Communication and motor skills are central to the management of ASD, as it contributes to learner's interaction with therapists and fellow learners during motor skill activities.

Key words

Autism Spectrum Disorder; Motor skills activities; Social Communication

Introduction

Autism Spectrum Disorder (ASD) is considered a neurodevelopmental disorder that can affect the cognitive skills of children. It can be defined as impairments in social functioning and communication (Taylor, Smith & Mailick, 2014; Dawson 2008; Landa, Holman & Garret-Mayer, 2007). Autism is classified as a spectrum disorder due to the symptoms, characteristics and abilities, which are expressed in many different degrees of severity and combinations (Mash 2016). It is now generally accepted that ASD is a biologically based neurodevelopmental disorder with numerous causes involving genetic and environmental risk factors (Faja & Dawson 2013). Neuropsychological impairments can be identified in many areas of functioning including memory, language, intelligence, attention, and execution of functions (Mash 2016; Blumberg, Bramlett, Kogan, Schieve, Jones & Lu, 2013).

Motor development activities have been shown to be beneficial in children diagnosed with ASD (Awamleh & Woll 2014). Many children diagnosed with ASD do not present a global deficit in their ability to form attachments, but rather the deficit in these children seems to be their inability to understand and respond to social information (You, Sernicleas, Rider & Chabane, 2017; Mash 2016). These effects may include improvement in a child's mental health and mood, ability to do daily activities and improved interaction with others (Yanardag, Erkan, Yilmaz, Arican & Düzkanta, 2015).

Children diagnosed with ASD experience a decrease in the development of motor behaviours such as balance, postural stability, gait disturbances, joint flexibility and movement speed, (MacDonald, Lord & Ulrich 2013; Staples & Reid 2010; Berkeley et al. 2001; Ulrich 2000). Early motor development activity helps prevent social isolation, not communicating with other children around them, and not expressing themselves. These activities may require the participation of parents, physical activity and special educational methods (Mash & Wolfe 2013; Awamleh & Woll 2014).

Srinivasana, Eigsti, Gifford & Bhat (2016) indicated improved post intervention levels of social verbalisation in the rhythm group (contemporary interventions) compared to the multi-system and robot groups (alternative mode of interventions). With motor development activities as a form of intervention, a number of changes were observed in children diagnosed with ASD. A study by Hansen, Watson, McConachie & Kaale (2016) used a modified intervention manual called the specific and global outcomes that aimed to improve the child's shared attention, imitation and shared

engagement during combined participation. The results showed a greater improvement in combined attention of children diagnosed with ASD using this social-communication intervention (Hansen et al. 2016; Brown, Odom & Conroy, 2001).

Loco-motor activities like walking help with maintaining balance, improving postural stability and the way of walking and decreasing the chances of falling. A study by Pace & Bricout (2015), concluded that after participating in motor development activity, the negative behaviour (cardiovascular risk factors) in children diagnosed with ASD decreased and the positive effect on the intellectual ability increased. There was also an increase in the time children spent performing a task without losing concentration. Pace & Bricout's (2015) results showed that motor intervention can help with improving overall well-being, behaviour and social communication skills in children diagnosed with ASD.

One of the possibilities that have been underexplored is the effect of motor skill activities on the social communication in children diagnosed with ASD (Lord 2000; Rao, Beidel & Murray 2008). For school-going children (learners), social communication may include school-based or common school-yard activities (Berkeley, Zittel, Pitney & Nichols, 2001; Ulrich 2000).

The aim of this study was to examine the effect of motor skill activities on the social communications skills of learners (as accessed through a school) with ASD; evaluate their initiations and maintenance of conversation through reciprocal responses, and responses to questions and comments.

Research Method and Design

Design

Background information on the learners was collected from parents. Data were collected by means of observations using a communication observation sheet. The learners were observed by a kinderkineticist and two postgraduate students who were familiar with the testing procedures of the social communication observations. Motor activities observed included balance, postural stability, walk disturbances, joint flexibility and movement speed. Observations took place at a centre specialising in children diagnosed with ASD and learners were observed while participating in the motor skill activities offered by the school. The learners were observed on the clarity of speech, maintaining eye contact, keeping to the topic, and ability to initiate a conversation. General observations of the interaction between learners and therapists were also documented.

Study Setting

The centre where the study was conducted is an early intervention centre for learners on the Autism Spectrum in Richards Bay, in the KwaZulu-Natal province in South Africa. The centre was established in September 2012. It is currently the only specialised centre in the area, and offers high quality specialised services to accommodate 20 learners diagnosed with ASD. The centre has an integrated programme that enables the learners to develop to the best of their ability and potential and to ultimately explore the world with confidence and independence. It is a one-stop service for early intervention therapy, which includes professional occupational and speech therapy, combined with a Foundation phase education equivalent to Grade 0 to 3. The centre provides classes in English and a unique and consolidated programme for each child based on the specific needs of the child, including monitoring and recording of individual progress. A one-on-one treatment programme is essential for skills development and to assist and improve learners with developmental delays that may have been identified.

The learners attend classes during the week and also take part in Kinderkinetics classes as well as Occupational and Speech Therapy. Each learner has a qualified tutor who has done various training workshops to assist the learner with daily academic as well as self-help activities.

Procedure

Three learners were observed during participation in an eight-week motor skill activity programme, each session was approximately 30 minutes long and took place once a week during the school day. The reason for the observation of the motor skill activities over eight weeks rather than the recommended 12 weeks was due to the fact that the school term only allowed for eight consecutive sessions.

Observations: The qualified kinderkineticist who completed various training workshops in ABA (Applied behaviour analysis) as well as the Fishbowl Autism Skills Development Programme conducted the observations of the motor skills activities and social communication skills. The content of the workshops and training included an introduction to ASD jargon, observations, areas of difficulty, independent learning, communications, sociability, sensory stimulation and curriculum. A two-week observation period took place prior to the planned observation of the motor skill activities to allow learners get used to the presence of the researchers. The existing motor skill activities, which forms part of the school's motor skills activity program which runs throughout the

year, took place in a controlled school environment, familiar to the learners so as not to disrupt the learners' daily routine.

All three learners that participated in this study were diagnosed with ASD by medical practitioners. Included in the study were the parents/guardians of the three learners. Parents were asked to complete a questionnaire which comprised of the following sections: demographic information about the child and their family, pharmaceutical and supplement-based history, early life history, developmental history.

Activities observed included fine oral motor skills (awareness, strength, coordination, movement, and endurance of the lips, cheeks, tongue, and jaw), gross motor skills (hopping, running, skipping and jumping) and fine motor skills (cutting, colouring and writing). Each motor development activity session was observed and documented using a social communication observation sheet to comment on each individual participant's communication occurrence. An existing communication rating scale (Rosenberg, Moran & Bart, 2017) guided the development of the observation sheet which was also approved by the occupational therapists to enhance validity. Variables and indicators were clarified, and two additional variables were added. The social communication observation sheet consisted of 17 items for observation. The observation schedule was divided into the following sections: clarity of speech; ability to make use of descriptive language; non-verbal body language; cooperation in answering of questions; eye contact with tutor; reciprocity/interactivity; ability to initiate conversation; use of correct language terminology; use of language; coherence of sentence; keeping to the topic of the motor activities; use of motor activity equipment; the ability to make use of descriptive language and the use of abstract humour during the activities.

Ethical Clearance

The privacy of the learners who participated in the research was of great importance. Each learner's observations were treated as confidential. The principal of the school granted the researchers permission to conduct the research on the school premises during the learners' weekly occupational therapy sessions, with no disruption of the learners' weekly therapy session.

Ethical clearance was obtained from the ethics committee of the Institution where the study is registered (UZREC 171110-030 PGD 2016/149). The necessary co-operation and written informed consent were obtained from the centre and the parents for the completion of the questionnaire and

the observation of the learners' participation in the motor development activities. All three learners attended school at the same centre.

Presentation of findings

Description of participants

A detailed case description of each of the participants is provided below. To uphold confidentiality, each participant was allocated a pseudonym.

Participant 1: Mark, (male) 6 years of age.

Mark lives with both his biological parents, who have both completed tertiary education. Mark has been attending the centre since 2013. Mark's mother indicated that he has limited verbal skills, and that he speaks in an unusual volume, pitch, rate and rhythm. She also indicated that he sometimes uses odd language or repeats the same phrase over and over. He attends speech therapy during school as well as swimming and horse riding lessons after school. Mark follows a gluten and casein free diet.

Mark was diagnosed with Pervasive Developmental Disorder (PDD) in 2013. This was prior to the changes made to the diagnosis in the DSM-5 where PDD was changed to ASD. He was diagnosed by a paediatrician in conjunction with assessments from an occupational therapist and neurologist. He had blood tests done as well as an MRI and a brain scan. Pervasive Developmental Disorders is a broad term used to define a wide range of disorders including spectrums of behavioural problems commonly associated with Autism (Pandolfi, Magyar & Dill, 2017; Fombonne, Simmons, Ford, Meltzer & Goodman, 2001).

During the motor skill activities, Mark's social communications showed some improvement, but Mark could benefit of more frequent motor skill activities over a longer period of time.

Participant 2: John, (male) 8 years of age.

John lives with his biological parents. Both his parents completed tertiary education. John takes Omega 3,6,9 and Biostrath (supplement-based treatment), attends speech as well as occupational therapy during school hours and swimming twice a week for 20 minutes after school.

John was diagnosed with ASD in 2014 by an educational psychologist as well as an occupational therapist. He first attended a regular government school and was transferred to the centre in 2014. John's mother indicated that he faces verbal challenges on a daily basis. John's hearing was tested as he sometimes spoke very loudly.

During the motor activities, John smiled and had a friendly attitude, in contrast to Mark. John's social communications skills improved during the motor skill activities.

Participant 3: Andy, (male) 7 years of age.

Andy lives with both his biological parents. Both parents completed their tertiary education. As with Mark and John, Andy also struggles with verbal challenges on a daily basis. Andy uses odd language and repeats the same phrase over and over again. Andy finds it difficult to hold a two-way conversation. Andy's mother indicated that he suffers from anxiety when introduced to a new environment. Andy attends speech therapy, special education classes, reading and writing assistance as well as mathematical assistance classes during school hours. Andy attends playball (fun-filled and sport lessons) once a week after school. The playball program is not specifically designed for children diagnosed with ASD and take place in a big group setting.

Andy was formally diagnosed with ASD in 2014, and he has been attending the centre since shortly after his diagnosis. During the motor skill activities, he used a lot of body language to communicate with the therapist.

Observations

Observations of participants on the 17 items included in the observation sheet are summarized in Table 1.

Table 1: Summary of observations

Items	Participant 1	Participant 2	Participant 3
Prosody of Speech	Mark speak in an usual volume and rhythm.	John speaks using an unusual volume, pitch and rhythm.	Andy spoke with good clarity.
Ability to make use of descriptive language	Mark displayed no ability making use of descriptive language.	As John displayed no use of descriptive language.	Andy displayed little descriptive language during the fourth week of the observations.

Prompt by Tutor	During the fifth week of the activities, Mark started counting without the prompting of the therapist.	John did not need as much prompting by the tutor as Mark.	Andy did not need as much prompting from the tutor as Mars and John.
Non-verbal Physical Reaction	The last week of the observations, Mark made use of a lot of hand gestures.	John enjoyed some of the activities and displayed little emotions during some of the activities.	Andy enjoyed (smiling and laughing out loud) the activities and when the therapist rolled the Pilates ball over him
Cooperation in answering of questions	During the fourth week of the motor activities, Mark participated answering questions. He could recognise numbers and pronounce them correctly.	During the activities, John responded well to the instructions from the occupational therapist.	During the third week of the activities, he was resistant to participate in some of the motor skill activities, and the therapist had to remind him to concentrate.
Eye Contact with Tutor	During the third week of activities. There was improvement in his eye contact with the occupational therapist.	John had good eye contact with the tutor and occupational therapist during the motor skill activities.	Andy had very good eye contact during the activities.
Reciprocity/Interactivity	This area of observation varied from week to week.	John displayed little reciprocity/interactivity.	Just as John, Andy displayed little reciprocity/interactivity.
Ability to initiate conversation	Mark found it difficult to hold a two-way conversation as well as expressing his emotions.	In contrast to Mark, John would ask questions during the motor skill activities to gather more information regarding the activities he needed to participate in. He kept conversation going with the therapist during the motor skill activities	During the activities, Andy waited for his turn, and correctly answered the questions which the therapist asked him. He did struggle with pronouncing some of the numbers that were part of the motor skill activities (counting how many bunny hops he could do). He could, however distinguish between the different colours that formed part of the activities.
Use of verbal communication	During the last week of motor skill activities, Mark chose a specific letter and made a sound associated with the letter.	John displayed good verbal communication during the observations.	Andy displayed good use of verbal communication. He would ask and answer questions that the tutor would ask during the activities.
Use of echolalia	During the motor skill activities, Mark did a lot of "TV talk" (repetition of phrases from movies, television shows and commercials), echolalia (repeating of noises and phrases that he heard) and made inappropriate sounds during the first five weeks of the activities.	During the fourth week of activity, he displayed a little echolalia. It was the only week that he displayed echolalia.	During the eight week of observations, Andy displayed a little echolalia during the activities.

Use of body language to support verbal language	During the second week of the motor activities Mark made use of body language. During the last week of motor skill, Mark used a lot of hand gestures to communicate.	During the third week of the motor skill activities, John copied his classmates when it was his turn to answer questions.	Andy did not display any body language to support verbal language.
Use of Language	Mark used correct sentence structure.	John struggled making use of the appropriate language.	Andy made good use of language during the last part of the observations.
Coherence (consistency/reasoning) of sentence	Mark coherence of sentences varied of the eight weeks of observations.	John struggled with the consistency of sentences.	Andy showed good consistency and reasoning during the observations.
Keeping to the topic	Mark kept to the topic during some of the lesson. This specific observation varied from week to week.	He had good concentration during the motor skill activities and John would sometimes keep to the topic of the motor skill activities.	He showed good compliance and interest during the motor skill activities.
Use the object for something else	He stuck to the objects used in the motor skill activities and did not use it for something else.	During the eight week observation Johan kept to the topic during lessons and the next week, he would not.	Andy did not use the various objects during the motor skill activities for something else.
Ability to make use of descriptive language	Mark was not able to use descriptive language on his own.	John made no use of descriptive language	Just as Mark and John, Andy does not make use of descriptive language.
Use of abstract humour	Mark did not make use of abstract humour.	John did not display abstract humour.	Andy did not make use of abstract humour.

Discussion

The purpose of the research was to examine the effects of motor skill activities on the social communication skills of learners diagnosed with ASD, as well as to evaluate the learner's initiation and maintenance of conversations through reciprocal responses, responses to questions and comments during the motor skill activities. The results indicated that the learners showed a slight increase in their conversational initiation during a specific motor skill task.

Conversational initiation can be defined as the action to start a conversation. Learners diagnosed with ASD have difficulty sharing achievements as well as enjoyment and excitement with other learners (Carpenter 2013). John and Andy showed enthusiasm and emotion (smiling and laughing) during the motor skill activities. Koegel, Kim, Koegel & Schartzman (2013) found that smaller group situations, that involved a specific interest provided the learners the opportunity to initiate their fundamentals.

In contrast to Mark, John and Andy tried to maintain a conversation and gave responses during the motor skill activities. Learners diagnosed with ASD have difficulty in communication, both with initiating as well as maintaining conversations, which requires social reciprocity (White, Koenig & Scahill 2007). John was the only participant who asked questions regarding the motor skill activities in which they participated.

Social reciprocity can be defined as the response to a positive action to maintain back and forth flow of social interaction. Learners diagnosed with ASD use language for requesting objects, requesting actions and protesting (Oke & Schreibman 1990; Koegel, Koegel, Frea & Fredeen 2001; Harper, Symon & Frea, 2008; Koegel et al. 2010; Koegel, 2000). Initiations and question-asking have been identified as important parts of an intervention (Warren, Baxter, Anderson, Marshall & Baer 1981; Mundy, Sigman, Ungerer & Sherman, 1989; Mundy, Sigman, & Kasari, 1990; Koegel & Koegel, 1995; Koegel, Camarata, Valdez-Mechaca, & Koegel 1997; Harper, et al. 2008; Paul, Chawaraska, Cicchetti & Volkmar, 2008).

Conclusion

This study clearly showed that the motor skill activities used produced observable benefits for the learners, and resulted in an improvement in their social interaction and social communication skills.

Recommendations that have been identified throughout the course of this study include allocating learners to groups according to the severity of their ASD when they are participating in motor skill activities. This will help to know what to focus on within that specific severity level to enhance the levels of improvement when learners are participating in motor skill activities.

A study conducted over a longer period of time, with more learners and a control group should be considered for further study to identify the differences between learners diagnosed with ASD compared to those not on the spectrum. This comparison will examine the effect of the intervention and assist to identify specific improvements within the participants.

Acknowledgements

The authors would like to acknowledge the parents/guardians of the participants, as well as the centre where the learners attend school.

Competing interest

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing the article.

Authors Contribution

C.dP. (University of Zululand) was the supervisor of this project; S.G. (University of Zululand) was the co-supervisor of the project; C.G, L.A., and L.M. (University of Zululand) were final year students who were significant in the data collection of this study.

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CHAPTER 6

Article 5:
Exploring the
effect of Horse Riding Lessons on the Social communication
skills of Learners diagnosed with Autism Spectrum Disorder:
A Case Study

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Reflection on the effect of Horse Riding Lessons on the Social communication skills of Learners diagnosed with Autism Spectrum Disorder: A Case Study

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Abstract

Background: Children diagnosed with Autism Spectrum Disorder (ASD) experience and exhibit a wide range of challenging difficulties in all aspects of their daily routines. Due to these difficulties, parents, caregivers and guardians look to various interventions to help improve the quality of their children's lives one of these is horse riding.

Objective: To explore the effect of horse riding lessons on the social communication skills of learners diagnosed with ASD.

Methods: Using a case study together with current research on autism interventions to reflect on four children's experience at weekly horse riding lessons.

Results: Our experience concurs with current research that horse riding lessons leads to an improvement in social function, which includes social skills and behaviours.

Conclusion: The results indicate that horse riding lessons have an achievable and potential positive effect on the social communication of children diagnosed with ASD. Horse riding lessons may provide a relatively simple and cost-effective means of assisting children to improve their social communication skills.

Keywords: Autism, horse riding lessons, social skills, communication

Introduction

The article will reflect on the personal observations and experience of horse riding lessons as a form of activity for children diagnosed with Autism Spectrum Disorder (ASD). Stories of critical moments shared in the journey of ASD diagnosis are based on three core symptoms that include impaired social interaction and communication abilities, restricted, repetitive and stereotyped behaviours and interest (Gabriels et al. 2012). These difficulties vary in nature and can affect these children throughout their daily activities as well as lifespan (Carbone, Farley & Davis 2012; Johnson, Myers & American Academy of Pediatrics Council on Children with Disabilities 2007). The cause of ASD is still unknown, therefore the main goal of treatments, therapies, interventions and activities are to treat the specific difficulties each child may be experiencing as opposed to treating the cause.

The prevalence of ASD is currently ratio 1:68 children across all socioeconomic, ethnic and racial lines (Centre for Disease Control and Prevention (CDC) 2014; Van Rooyen 2016). ASD is the second most common disability after intellectual disability (CDC 2014; Van Rooyen 2016). However, there still remains a major gap in what is known about this global disability, especially in Africa (Ruparelia et al. 2014). Currently, there is no prevalence statistic of ASD in South Africa (Van Schalkwyk, Beyer & De Vries 2016; CDC 2014; Ruparelia et al. 2014; Elsabbagh et al. 2012). Although most children diagnosed with ASD are from low and middle income countries, most research is being conducted in high-income countries (De Vries 2016).

When children display noticeable developmental delays, parents/guardians and/or caregivers spend extensive time, energy and financial resources to confirm the diagnosis (Clasquin-Johnson & Clasquin-Johnson 2018; Gibson 2014; Fletcher, Markoulakis & Bryden 2012; McCollum 2012). According to research (Byford, et al. 2015) there is a growing interest in early interventions for children diagnosed with ASD, yet there is little evidence of cost-effective treatments, therapies, interventions and activities.

The aim of this current study was to determine the effectiveness of horse riding lessons on the social communication of learners (accessed through a school) diagnosed with ASD. Current research reports that there are benefits of therapeutic horse riding for learners diagnosed with ASD (Goodwin, Hawkins, Townsend, Van Puymbroeck & Lewis 2016; De Milander, Bradley & Fourie 2016).

The researcher is an academic with a background in Kinderkinetics. Kinderkinetics is an exciting specialized paediatric field with the purpose of increasing the total well-being of the typical developing child between the ages of 0-13 years. This programme includes stimulating, promoting and rectifying age specific neuro-motor as well as physical activities (www.kinderkinetics.co.za). The study of Kinderkinetics is currently offered by various universities in South Africa. Kinderkinetics as a paediatric science is currently studied over a period of 4 years. It consists of paediatric exercise that includes various programmes based on scientific and well-researched motor-learning values. The specialized programs are being offered by highly trained health practitioners, called Kinderkineticists.

Before becoming an academic, the researcher owned a Kinderkinetics practice, where she came into contact with children diagnosed with ASD. This was the biggest challenge ever encountered in the practice. Although highly educated, the researcher was unprepared to deal with patients diagnosed with ASD, as the treatment of ASD in South Africa is challenging for both parents and professionals.

ASD is one of the most expensive disabilities to manage (Clasquin-Johnson & Clasquin-Johnson 2018; Byford et al. 2016; Hall, Wright & Mills 2016; Cimera & Burgess 2011). Parents and guardians of children with ASD are constituted as a vulnerable community (Clasquin-Johnson & Clasquin-Johnson 2018, Lin, 2014), as they will do anything to help their children perform daily activities successfully.

Parents/guardians are faced with the extreme cost of early interventions and the need for specialised education that requires small classroom numbers (Lokhandwala, Khanna & West-Strum 2012; Wang et al. 2012; Chasson, Harris & Neely 2007).

Research design

Due to the complexity and distinctive nature of the characteristics of children diagnosed with ASD, there has recently been an opportunity to provide alternative research methodologies to answer diverse questions regarding various treatment, therapies, interventions and activities (Horner, Carr, Halle, McGee Odom & Wolvery 2005, Simpson 2005; Shavelson & Towne 2002). The preferred source of this information is parents and professionals (Simpson 2005). The study design was qualitative, using participant observation of the learners during weekly

horse riding lessons and in-depth interviews with the school's principal and occupational therapist. This study design forms part of the social constructivism theory.

The school where the research was conducted is a school for learners with intellectual disability between 6-18 years of age, and is located in Empangeni, South Africa. The learners are all intellectually disabled and come from multicultural, multi-language backgrounds. The school has been identified as a Resource Centre by the National and Provincial Department of Education to pilot the National Educational Policy on Inclusion. The school focuses on a holistic education. A special adapted teaching programme based on the National Curriculum Statement (NCS) and Curriculum Assessment Policy Statements (CAPS) is followed to prepare the learners with life skills and basic academic skills. Learners are also given the opportunity to participate in sport, dancing, cultural activities, choir, physical education and occupational therapy. These opportunities ensure that the learners function optimally in terms of their emotional, motor and cognitive development at various levels.

The occupational therapists at the school were fully involved in screening, assessment and appropriate placement of each learner. Learners that participated in the study were selected on the basis of attending of horse riding lessons an animal farm approximately 20 km from the school.

The learners participated in horse riding lessons once a week, and the riding lessons lasted approximately 20 minutes. Afterwards, the learners all had breakfast together at the animal farm where the lessons take place. The learners travel to the animal farm by bus and the bus ride lasts approximately 30 minutes. The participant observations was done over a period of eight weeks. The reason for the eight-week observation period, instead of the recommended 12 weeks, was as a result of weather conditions and the duration of the school term. Observations took place in the last term of the school year.

Ethical Considerations

At the beginning of the study, the University of Zululand Research Ethics Committee approved the research proposal for this study. Ethical approval was also obtained from the Faculty of Science and Agriculture of the University of Zululand (UZREC 171110-030 PGD). All efforts were made to maintain the basic ethical principles outlined by the KZN Department of

Education. The principles of research merit and respect were upheld throughout the study. In line with these principles, parents of the participants were given an information letter before participating in the study. The letter contained the following: an explanation of the study, data gathering methods and potential benefits of the research, and assurance that parents/guardians of learners diagnosed with ASD could withdraw participants from the study at any time without preconception.

Data that was provided by the participants was used solely for the proposed research and privacy is considered vital when conducting research with learners diagnosed with ASD, therefore all information was treated as confidential. All identifying details were removed from the data used in the study and all parents/guardians were assured that their identity would remain permanently autonomous. Prior to the start of the study, parents/guardians completed a consent form to indicate that they and their children agree to be involved in the study.

The principal and occupational therapist of the school also approved the observations to be conducted during the learners' horse riding lessons at the animal farm; thus the routine of the learners were not compromised.

Participants

The learners who participated in this study were all identified by the occupational therapist. The riding lessons were conducted during the school hours. Mo

Learner one was a boy (A-A) 9 years of age. Learner A-A has been attending the school since 2016. He was formally diagnosed with ASD by a General Practitioner. He faces non-verbal challenges on a daily basis, and is unaware of social conversations/appropriate social behaviours. For instance, he does not like being hugged, as well as struggled with making friends at school and the concept of making friends.

Learner two was a boy (A-B) 10 years of age. He has been a learner at the school since 2014. He was formally diagnosed by a General Practitioner in 2013. Just as learner one, he also faces both verbal and non-verbal challenges. He finds it difficult to maintain or engage in a two-way conversation. It was observed that he found it difficult to explain how he feels using words, expressions or gestures.

Learner three was a girl (A-C) 9 years of age. She has been a learner at the school since 2015. She is very shy and quiet. Even though her parent/guardian indicated that she is unaware of social conversations and appropriate social behaviour, she was very aware of the researcher's presence at the lessons. While she struggles to hold a two-way conversation, it was observed that she maintained good eye contact with the researcher when greeted.

Learner four was a boy (A-D) 13 years of age and he was the oldest participant in the group. He has been a learner at the school since 2015. Learner A-D has been participating in the horse riding lessons for the longest period. He is the most socially communicative of all the learners participating in the horse riding lessons.

Case study

Arrival

Learners arrived on the school bus, at a local animal farm for their weekly horse riding lessons. The occupational therapist, her assistant and bus driver accompanied the learners to the animal farm. The bus trip took approximately 30 minutes from the school to the farm.

The researcher immediately observed that during the first lesson learner A-A has an overwhelming interest in the bus keys. Learner A-A stayed very close to the bus driver, and followed him everywhere. As soon as learner A-A got off the bus at the animal farm, the bus keys were the first thing he started looking for. During some of the lessons, the bus driver handed the keys to him. A-A presented with stereotyped and repetitive body movements such as hand flapping from the time he stepped off the bus until the time he got on the horse. Learner A-A needed help to go to the bathroom and wash hands, which forms part of the activities on arrival at the farm. The researcher sometimes had to keep an eye on him, as the Occupational Therapist assisted the other learners. It was observed that learner A-A liked to wander off from the group, and had to be fetched a few times, while the therapist was busy with the other learners.

Learner A-B was a very quiet and shy learner. He would simply follow the instructions from the occupational therapist, assistant and the bus driver. It was observed that he only needed assistance with washing his hands after going to the bathroom. He would quietly stand in line

and wait for the other learners to finish. He would not communicate with the researcher or any other learner.

At the very first lessons I noticed that learner A-C was very nervous about my presence, but as the weeks progressed she made more eye contact and even engaged in verbal greeting after the second week. Learner A-C made friends with another learner in the group. This was quite a unique observation for me, as her parent indicated that she finds it difficult to hold a two-way conversation. She and her friend would sit next to each other on the bus ride. During the third week of observations, it was noticed that learner A-C was not having a good day. She arrived at the animal farm and did not greet or make eye contact with the researcher. When asked, the occupational therapist explained that her friend was late for school and that learner A-C was waiting patiently for him. During every bathroom routine, the two of them would always make sure that they can see each other or stand next to each other in the line.

During the fourth week of the observation, the researcher arrived wearing rainbow earrings. Learner A-C immediately noticed my earrings and for the rest of the lesson she would say the word “rainbow” and point to the earrings. The occupational therapist indicated that learner A-C was very interested in art. Learner A-C did not require any assistance during the bathroom routine. She would wait patiently in line for the rest of the learners to finish.

Learner A-D would come toward the researcher as soon as he stepped off the bus and say his name. He would come up to researcher and take the pen and paper and write his name and age. He was the only learner in the group that could read and write. Every time the researcher writes down an observation he would come and stand next to me to see what was being written. He would say his name over and over and that he was “good boy”. Repetitive behaviour is one of the characteristics of learners diagnosed with ASD. It was observed that he is a very independent learner, and did not need any assistance during the bathroom routine.

Learner A-D exhibited a severe echolalia during the first part of the lessons. Echolalia (repetition of noises and phrases) is a persistent occurrence in learners diagnosed with ASD who are verbal (Sterponi & Shankey, 2014). Out of all the participants, he displayed the most verbal communication skills. As soon as he stepped off the bus, he began exhibiting echolalia. During one horse riding lesson, he repeated a slogan from a television commercial. The

Occupational Therapist indicated that he has been doing it since he arrived at school. It was observed that he exhibited echolalia during a few more lessons.

Horse Riding Lessons

After arrival and bathroom routine, the learners, researcher and occupational therapist all walked together to the stables. The occupational therapist explains if the learners experienced any difficulty during the week at school and therapy or if there had been any changes in their routine.

On arrival at the stables, the researcher assisted the Occupational Therapist to put the horse riding helmets on for each of the learners. Some of the learners had a specific choice of helmet. They would point to a specific helmet and I would place it on their head.

As a Kinderkineticist, it was observed that participant A-A has very poor muscle tone. He struggled to get on the horse as well as hold onto the reins of the horse. He also struggled to maintain his balance on the horse. The Occupational Therapist as well as her assistant had to remind him to hold onto the reins. They also had to assist him sometimes to maintain his balance by holding onto his back. When walking with the learners, it was observed that his upper body was “floppy”, due to the muscles not helping support the skeletal system (Pan, et al. 2016; Healy, Nacario, Braithwaite & Hopper, 2018). Developing upper body muscle tone is very important as it assists children when they are sitting at their school desks, eating dinner and doing physical activity.

Once A-A got onto the horse and we started walking, the hand flapping and noises quieted down. He mimicked the horse noises and laughed at himself. He loved it when the horses started to gallop and he would laugh out loud. As a Kinderkineticist, I observed that the horse riding lessons were very beneficial for this participant. As the weeks went on, his upper body control and muscle tone improved. He was sitting on the horse with better posture. His stereotyped and repetitive body movements were less on certain days.

During the horse riding lesson learner A-B was very quiet. He displayed better posture control and muscle tone during the riding lesson and did not struggle to get on the horse. He did however place his hands over his ears during some of the horse riding lesson as well as later at breakfast time. This gave an indication that he might be sensitive to noises. From literature it

is known that some learners diagnosed with ASD are sensitive to certain noises (Chang et al. 2012).

Learner A-C did not need any assistance getting on the horse. The lower prevalence of ASD in girls, limited opportunity for the girls to establish friendships with other girls (Jamison, 2018), but she had developed a friendship with one of the other male learners in the group. They would look for each other during the lessons. The other male learners did not socially exclude her during the lessons.

During the horse riding lessons, they would make regular eye contact with each other, which is very important to girls (Jamison, 2018). Learner A-C always stood by her friend and they would choose their helmets together. The riding instructors knew that they are friends and made sure that they walked close together. During one of the lesson, learner A-C laughed out loud when the horses started to galloped. The researcher also observed that she would look for me during the ride. When walking slowly, she would turn around and make eye contact.

During the lessons, it was observed that Learner A-C followed instructions from the occupational therapist as well as the riding instructors. This is an excellent indication of social communication skills. It was also observed that she displayed emotions such as laughing. Literature has indicated that learners diagnosed with ASD experience difficulties in social interaction and communication which can include: nonverbal communication such as eye contact and body language, developing and maintaining friendships; as well as social emotional reciprocity including conversation skills and emotions (Church et al. 2000; Daniel & Billingsley 2010; Tanaka & Sung 2016). It was observed that the horse riding lessons had a positive effect on this particular learner. Her social communication skills improved with every lesson.

Learner A-D's echolalia subsided slightly as soon as he got on the horse. He displayed good body posture during the lesson and sometimes followed instructions from the occupational therapist, assistant and ridding instructors. As the researcher walked with the learners on their horses, learner A-D displayed good body posture and sometimes followed instructions from the occupational therapist, assistant and horse riding instructors. He did not need any assistance getting on the horse.

At one of the lessons, he was unnerved by the laughing of the instructors and he was scared of the dog on the farm. He would hide behind the researcher, bus driver and Occupational Therapist. Recent literature proposes that anxiety-related concerns are among the most common presenting difficulties for learners diagnosed with ASD (White et al., 2009). Fear and anxiety are reported to be more prevalent in children with ASD than in neurotypical learners (Kim et al. 2000; Leyfer et al. 2006; Weisbrot et al. 2005)

Breakfast Time

After the horse riding, all the learners ate breakfast, consisting of porridge, sandwiches and tea, together. We walked together to patio area with tables and chairs where the children took seats around the breakfast table. The occupational therapist would have asked if any of the learners wanted anything to drink. Learners raised their hands if they wanted tea.

Learner A-A's parents tried and stick to specific routines. His mom packed him a balanced lunch every day and he has a very healthy appetite. Curtiss and Ebata (2018) reported that meal times could be a stressful for families of learners diagnosed with ASD. Learner A-A did not exhibit any food sensitivity; he ate everything that his mom packed in his lunchbox. He even indicated in one lesson for me to open his juice bottle.

During the horse riding lesson learner A-B did not interact very much with his fellow learners, but he did communicate with the occupational therapist and one other learner during breakfast. Learner A-B placed his hand over his ears while the other learners prayed. I observed that he had a poor appetite, and that the occupational therapist had to urge him to finish his breakfast.

Learner A-C sat down next to her friend and the two of them ate their breakfast together. She has a very healthy appetite and does not demonstrate any food aversion.

Learner A-D would start with echolalia again as soon as we walked over to breakfast, and would continue during breakfast. Sometimes the occupational therapist have to encourage him to eat his breakfast. He also had a healthy appetite and no food sensitivity.

Conclusions

South African children diagnosed with ASD have very limited support from the start of the diagnosis process to the selection of the various therapies, treatments, interventions and activities. With this article, we would like to offer parents/guardians direct feedback on the various therapies, treatments, interventions and activities available and their potential contribution to the wellbeing and development of the child.

Recent studies (Bass, Duchowny & Llabre, 2009; Bizub, Ann & Davidson, 2003; All, Loving & Crane, 1999) note that animal-assisted activities have a positive influence on learners diagnosed with ASD. These positive outcomes may be as a result of exposure to the horses. It can be concluded that the riding lessons assist in improving the social communication skills of all learners, for some the improvement is more visible. Even though they struggled to make friends during the horse riding lessons, they were able to sit on the bus together, participate in horse riding lessons as well as sit around a table with their fellow learners and enjoy their breakfast. This is very important, as it forms part of social interaction.

Limitations of the study

There were several limitations to the study. There was insufficient background information on each of the participants. Parents/guardians unwillingness to share information regarding their children also had to be taken into consideration. Participation in the horse riding lessons was also inconsistent. Some of the learners did not complete the 8 weeks of horse riding lessons and therefor had to be excluded from the observations. The learners were already participating in the horse riding lessons when the observation commenced for varying time which limits the generalisation of the findings of the research.

Recommendations

An increase in the duration of the horse riding lessons is recommended for a more powerful form of treatment that would result in greater improvement in the children's social communication skills. The benefits of the horse riding lessons should also be explained in depth to the parents/guardians. The parents/guardians should attend some of the lessons in order to observe the learners' behaviour, interaction and social communication. There is also a need to educate the parents/guardians regarding other types of treatments, therapies, interventions, and activities which may improve the social communication in learners diagnosed with ASD.

Acknowledgements

The researcher would like to thank the principal, occupational therapist, owners of the animal farm, parents/guardians and learners for their willingness to participate in the study.

Competing interest

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Author contributions

C.G. is the primary data collector, and wrote 40% of the final article.

S.G. wrote 30% of the article and was responsible for editing.

C.D.P. wrote 30% of the article and was responsible for editing of the article.

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CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY

7.2 CONCLUSIONS

7.3 LIMITATIONS

7.4 FURTHER RESEARCH

7.5 REFERENCES

The main aim of this study was to describe the current treatments, therapies, interventions and activities utilized by learners aged 6 to 12 diagnosed with Autistic Spectrum Disorder in the KwaZulu-Natal (KZN) province, South Africa, and to investigate the efficacy of interventions on social communication. In line with the overall aim, learners were accessed through a private centre and a government school that specialize in Autism Spectrum Disorder. From this overall aim the following four specific objectives was phrased:

Objective 1

The objective of this part of the study was to provide estimates on quantities and types of pharmaceuticals and/or supplementation-based treatments use among children with ASD in a developing country, such as South Africa.

Objective 2

This part of the study explored the role of a sensory integration intervention program, using the Sensory Disorder checklist, in children with ASD and to determine the timeframe within which the effects of such an intervention could be observed.

Objective 3

This part of the study examined the effects of a motor skill activity program on the social communications skills of learners diagnosed with ASD, and evaluated their initiations and maintenance of conversations through reciprocal responses, and responses to questions and comments.

Objective 4

This part of the study explored the effect of horse riding lessons on the social communication skills of learners diagnosed with ASD.

7.1 SUMMARY

ASD is a group of heterogeneous conditions characterized by impaired interaction, difficulties with language and communication, repetitive stereotypical behaviors, and/or a very limited range of interests (Attwood, 2006; Guthrie, Swineford, Nottke & Weterby, 2013; Christensen, Baio, Van Naarden, Bilder, Charles et al., 2016). Severity ranges from severe mental disability to so-called “high functioning autism”, which describes a learner with ASD, with normal or high intelligence but with social difficulty (Johnson & Myers, 2007).

Symptoms of ASD are typically recognized during the second year of life (12-24 months of age) if they are subtle, but may be seen earlier than 12 months if developmental delays are severe (Ganz, Earles-Vollrath, Heath, Parker, Rispoli & Duran, 2012; Insel, 2012; American Psychiatric Association, 2013; Centers for Disease Control and Prevention, 2014; DClinPsy, Hull & DClinPsy, 2017).

Despite the increase in the prevalence of the disease globally and the fact that it is also becoming more common in South Africa, there is still little understanding of its etiology. While genes have been pointed out to play a serious role in determining the risk for pervasive developmental disorders, the specifics contributing to ASD have been very difficult to describe (O’Roak & State, 2008). The early diagnosis of learners with ASD is critical but it is often postponed until they have to go to school (Mandell, Novak, & Zubritsky, 2005). Learners diagnosed with ASD are almost unanimously delayed in the achievement of spoken language. Although rates of functional use of speech have increased in this population during the last decade (Rogers, 2006), the

achievement of spoken language remains an especially important attainment for learners diagnosed with ASD. Learners who do not acquire speech as a primary means of communication by school age tend to have restricted outcomes in terms of independence and integration (Howlin, 2005). Therefore, it is important to make every attempt to induce speech in preverbal learners with ASD during the preschool period, in order to maximize opportunities for social interactions with family and peers and participation in mainstream settings in school and later life (Paul, Camphell, Gilbert & Tsiour, 2013).

Parents and caregivers face many issues and challenges on a daily basis (Adams, Gouvousis, VanLue & Waldron, 2004). Parents reported that learners experience difficulties in two main areas; the first being persistent difficulties with social communication and social interaction (Adams et al., 2004). For example, they may find it hard to begin or sustain a conversation; they may not understand social rules such as how far to stand from another person, or they may find it difficult to make friends. The second area in which they have difficulty is restricted, repetitive patterns of behavior, interests, or daily routines. They may develop an overwhelming interest in something, they may follow inflexible routines or rituals, they may make repetitive body movements, or they may be hypersensitive to certain sounds.

As with many aspects of autism early intervention is required to minimize the delays in development (Anderson & Romanczyk, 1999; Aldred & Green, 2009). There are numerous treatments, therapies, interventions and activities that have been designed to help learners with autism, including applied behavioral analysis, drama therapy, gluten-free diet, Lego therapy, sensory integration training, snake oil, speech therapy, swimming with dolphins, horseback riding and supplement-based treatments, to name but a few (Bass Duchowny & Llabre, 2009; Aitken, 2010).

Most appear to produce benefits and people experiment with a variety of treatments, therapies, interventions and activities. Unfortunately, in some cases, these apparent benefits are short-term, insignificant or illusory. Any benefit may be outweighed by the financial and emotional costs of the intervention, or the dangers inherent in some therapies. At present, there is very little valid scientific research into the effectiveness of most of these treatments, therapies, interventions and activities.

Chapters 2, 4, 5 and 6 are presented in the form of research articles targeting specific journals for potential publication, while Chapter 3 on sensory integration has already been published in HealthMED. Except for Chapter 2, each chapter clearly indicates the research design, results, discussion and conclusion.

7.2 CONCLUSION

The conclusions drawn from this research are presented below:

7.2.1 Treatments, therapies, interventions and activities utilized by children diagnosed with Autism Spectrum Disorder: A Systematic Review

There are no specific treatments, therapies, interventions and activities specifically developed to address the difficulties associated with ASD and parents/guardians try a variety of treatments, therapies, interventions and activities. It is very important for therapist, educators and parents/guardians to keep up to date with international research. Many of the studies presented in the review are of insufficient depth or conducted on small samples which limit generalizability. Both government and private school educators in South African should attend training in all of the areas associated with ASD. Many of the children attending above mentioned schools are not formally diagnosed.

7.2.2 Survey of pharmaceutical and supplement-based treatments utilized in children with Autism Spectrum Disorder

It is known that investigators have difficulty recruiting sufficient participants since not all children diagnosed with ASD use pharmaceuticals and supplements-based treatments. In addition, such studies in South Africa have the added load of struggling against parents/guardians denying an ASD diagnoses due to the continued stigma associated with cultural beliefs and practices. All of these factors make it difficult to provide estimates and types of pharmaceutical and/or supplementation use among children with ASD. Health care providers should be aware that a high prevalence of pharmaceutical and supplement-based treatment use exists among children with ASD

in developing countries, and may be equal to that of western countries, despite its continued stigma and should attempt to understand the decision-making processes that underlie treatment selection, combining of treatments and how it is combined with other interventions.

7.2.3 Role of Sensory Integration Therapy in Sensory Processing Disorder in Children with Autism Spectrum Disorder (ASD).

The treatment of ASD is still very poorly understood. The use of sensory integration interventions can be used to treat the symptoms associated with Autism Spectrum Disorder such as behavior, cognition and mood. At the beginning of the study it was unclear how a four-week sensory integration intervention would impact learners diagnosed with Autism Spectrum Disorders and how the contributing factors might influence these changes. At the end of the study, movement in this sample showed a significant improvement from the pre-test to the post-test. It is concluded that movement during a 4-week sensory integration intervention may positively influence the behavior, cognition and mood of learners diagnosed with Autism Spectrum Disorder. This positive influence can also assist the quality of learner's performance of daily activities. It should though be emphasized that since movement is part of everyday life, one should refrain from attributing the improvement solely to the intervention. It was hypothesized that sensory integration improves the behavior, mood and cognition of learners diagnosed with Autism Spectrum Disorder, but it requires further study over a longer period of time with a bigger sample to see a significant result.

7.2.4 Effect of Motor Skill Activities on the social communication skills of learners diagnosed with Autism Spectrum Disorder

Learners diagnosed with ASD face several challenges especially in the area of social communication. Little is however known about the effect of motor skill activities on the social communication skills of learners diagnosed with ASD. The observation of three learners during motor skill activities. Activities observed included fine oral motor skills (awareness, strength, coordination, movement, and endurance of the lips, cheeks, tongue, and jaw), gross motor skills (hopping, running, skipping and jumping) and fine

motor skills (cutting, colouring and writing). The results indicated that there was a varied improvement in social communication skills of learners diagnosed with Autism Spectrum Disorder with the motor skills intervention. The improvements depend on the level of the spectrum the learner falls in. Communication and motor skills are central to the management of ASD, because it contributes to their interaction during activities.

7.2.5 Reflection on the effect of Horse Riding Lessons on the Social Communication skills of Children diagnosed with Autism Spectrum Disorders

Learners diagnosed with ASD experience and exhibit a wide range of challenging difficulties in all aspects of their daily routines. Due to these difficulties, parents/guardians and caregivers seek various treatments, therapies, interventions and activities to help improve the quality of their children's lives. One of the, therapies that parents explore are animal-assisted activities. During the eight weeks of observations of horse riding lessons it indicated that horse riding lessons can have an achievable and potential positive effect on the social communication skills of learners diagnosed with ASD. Participation in horse riding lessons may provide a relatively simple and cost-effective means of assisting learners to improve their social communication skills.

7.2.6 Overall impact of the study

The findings from the study on the various treatments, therapies, interventions and activities for children diagnosed with ASD, have practical implications for health care practitioners, educators and families of children diagnosed with ASD. A wide variety of diverse and complex treatments, therapies, interventions and activities have been designed to improve the quality of the life of children diagnosed with ASD. Education is essential to help children with ASD to learn everything from everyday skills (such as brushing one's teeth) to cognitive skills (such as reading) to social skills (such as how to make friends).

Understanding each of these treatments, therapies, interventions and activities in assisting children with ASD may also play a role in how they are incorporated in family and peer settings. Educating moments may occur at any time and just as frequently, if not more frequently outside of the classroom setting as it does inside the classroom. Children learn from their relatives as well as from their friends.

There are no one size fits all when it comes to the combination of treatments, therapies interventions and activities for children diagnosed with ASD. Parents/guardians should work hand-in-hand with educators and health care practitioners to identify and implement treatments therapies, interventions and activities suited to the needs of each individual child. This will contribute to enhancing the quality of life of each child and allow each to develop to their full potential. This research provides the first step towards translating the evidence into practice regarding the understanding and implementation of treatments, therapies, interventions and activities for children diagnosed with ASD.

7.3 LIMITATIONS

There are various studies on treatments, therapies, interventions and activities for learners diagnosed with ASD. There are certain limitations that need to be considered when interpreting the results. External factors in the children's life cannot be controlled but can greatly affect the outcome of interventions taking place in the controlled environment, for example the school. The sample sizes in this study were very limited due to parent's/guardians unwillingness to consent to participation in this research. In addition to this, the durations of the interventions were too short to allow for any generalization on long term effects.

7.4 FURTHER RESEARCH

7.4.1 Recommendations for further research

It appears from the study that there is a need for further research regarding the following:

-
- The comparison between pharmaceutical and supplement-based treatments utilized by children diagnosed with ASD in South African and other countries.
 - The influence of culture on the diagnosis of ASD and choice of treatments, therapies, interventions and activities of Autism Spectrum Disorder in South Africa.
 - Increase in sample size and duration of interventions or observation period is recommended for further research.
 - It is very important to make South African health professionals, parents/guardians and educators, especially those parents/guardians that fall into the lower income category, aware of evidence based pharmaceutical treatment for children diagnosed with ASD.

7.4.2 Recommendations for parents/guardians and educators/therapists

- It is recommended that there should be more education for the parents/guardians of children diagnosed with ASD regarding the various treatments, therapies, interventions and activities. More education on which treatments, therapies, interventions and activities are available and how to select those suitable for their child is recommended.
- Awareness raising in the media to reduce stigma, improve understanding of ASD, encourage early diagnoses and encourage take up of various interventions to address symptoms associated with ASD
- Some children with ASD attend main stream schools, so it is imperative for the educators in these schools to be educated to adequately attend to the needs of these learners.

-
- Considering the increase in the prevalence of ASD, the Department of Basic Education in South Africa should channel more funds to special schools where early interventions can assist learners diagnosed with ASD to develop to their full potential.

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Appendixes

Appendix A: Formal Letter to Schools

Appendix B: Instructional letter to parents/guardians

Appendix C: Informed consent declaration (survey consent)

Appendix D: Autism medication & supplement Survey

Appendix E: Informed consent declaration (parent/guardian)

Appendix F: Informed consent declaration (child participation)

Appendix G: Informed consent checklist

Appendix H: Social communication observation sheet

Appendix I: Ethical Clearance Certificate

Appendix J: Proof of publications

Appendix K: Sensory Processing Disorder Checklist

Appendix A



“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”

Formal Letter to Schools

January 2014

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT YOUR SCHOOL

Dear Principle/Headmaster

Following our telephone conversation/email discussion, I hereby seek your consent to participate in this research.

My name is Chantell Gouws, and I am a PhD student at the University of Zululand with the following research title: *“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”*

The project will be conducted under the supervision of Dr. C Du Preez and Dr. S Govender (UNIZULU, South Africa)

I have provided you with a copy of my draft research proposal as well as copies of the questionnaires and consent forms to be used in the research process.

If you require any further information, please do not hesitate to contact me on 082 2595 191 or email Gouwsc@unizulu.ac.za.

Thank you for your time and consideration in this matter.

Kind Regards,
Chantell Gouws

Appendix B



*“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder
and the Efficacy of selected Interventions on Social Communication”*

Instructional letter to parents/guardians

Dear Parent or Guardian

RE: Autism Pharmaceutical & Supplement-based Research Survey

Thank you for participating in this research.

There have been several studies in the United States of America exploring the prevalence and patterns of pharmaceutical and supplement-based use in the autistic spectrum disorder population. There have been limited studies to date in the South African context.

The aim of this survey is to look at the utilization of pharmaceutical and supplement-based treatments in children diagnosed with autism spectrum disorders in the Kwa-Zulu Natal

Pharmaceuticals includes those prescribed by a doctor as well as over the counter preparations, vitamins, supplements and special diets. The information gained in this study will help to inform prescribing practices as well as to guide further research into the field of autism spectrum disorder.

In order to be included in the study your child must:

- Be between the ages of 2 and 12 years.
- Be living in the Kwa-Zulu Natal.
- Have a formal diagnosis of an autism spectrum disorder made by a doctor or psychologist.
- Autistic spectrum disorders include Autistic Disorder, Asperger's Disorder and Pervasive omit
- Developmental Disorder Not Otherwise Specified.
- Be attending an educational placement.

This survey consists of **THREE SECTIONS**.

SECTION A: Demographic Information of child and Parents/guardian

SECTION B: Developmental & Medical History of Child

SECTION C: Therapies and Treatment

Please follow the instructions carefully when completing the survey. It should take roughly 30 minutes to complete all parts of the survey.

Please complete one survey per child.

The information you providing will remain confidential at all times. Your child's name will not be used when reporting the findings. No one outside of the investigators will be allowed access to the information you have provided. In any future presentations or publications your child's name will not be used. On completion, the findings from the study will be presented to all interested parties.

You will be able to access the findings.

Your participation in this survey is entirely voluntary. Should you choose not to participate or to withdraw from the survey at a later stage you will not be prejudiced in any way.

If you choose to participate in this study, there will be no direct benefit to you; however, the information we obtain from this study will give a better understanding of the use of

pharmaceuticals and supplement-based treatments in children diagnosed with Autism Spectrum Disorders in the KZN. This is only a survey so there is nothing painful or dangerous about participation; however, you will be asked questions about your child's health which may be very personal. Some people may find it difficult to discuss these matters.

Once you have read and understood this information sheet, please sign the consent form giving permission to use the information you have provided for the purpose of this study.

Please return the completed forms including the signed consent form to the school in the confidential envelope provided.

Thank you for taking the time to participate in this survey.

If you have any queries or require further assistance please do not hesitate to contact me: Gouwsc@unizul.ac.za or 082 2595 191

Kind Regards,

Chantell Gouws

Lecturer

Kinderkineticist

Faculty of Science & Agriculture

Department of Human Movement Science

University of Zululand

Appendix C



“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”

PARENT/GUARDIAN INFORMED CONSENT

Informed Consent – Survey

Title: *“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”*

C Gouws (MSc) Kinderkinetics (PhD Student)

1. I am aware that Chantell Gouws the researcher from the Department of Human Movement Science, University of Zululand has requested my permission to be involved in the research, with the title: *“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”*
2. I am aware that the purpose of the research study is to investigate the efficacy of an intervention program on communication of autistic children.
3. I am aware that the University of Zululand has given ethical clearance to this research project and I have seen/may request to see the clearance certificate.

-
4. I am aware that I will be required to fill in a questionnaire. I am aware that there is an intervention program.
 5. I understand that the scientific research will be published, and my name and identity will be kept anonymous. However, the supervisors and co-supervisors of the article will have permission to view my name and identity.
 6. I am aware that any questions concerning the research or my participation will be answered by Chantell Gouws 082 2595 191.
 7. I will receive feedback in the form of a email on the results obtained during the study. I have full access to any results of my own which I wish to view. I will not be paid any compensation for this research.
 8. I have read and understood the above information and fully understand what is expected of me during the research. I have asked all questions that I wish to be addressed and these have been answered to my satisfaction. I am aware that I can withdraw from the research at any time without occurring any penalty or loss.
 9. By signing this informed consent, I am not waiving any legal claims, rights or remedies. A copy of this informed consent will be given to me, and also kept on record.
 10. If you are unable to complete this survey in English, please feel free to contact the researcher for an interview.

Subject Name _____ Date: _____

Subject Signature: _____

Researcher: _____ Date: _____

Signature: _____

Appendix D



*“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder
and the Efficacy of selected Interventions on Social Communication”*

PHARMACEUTICAL & SUPPLEMEN-BASED SURVEY

Questionnaire number:

Date:

SURVEY ABOUT CHILDREN DIAGNOSED WITH AUTISM SPECTRUM DISORDER

All information provided in this survey will be treated as confidential.

Please answer all the questions as detailed as possible

SECTION A: Demographic Information of child and Parents/guardian

1. Child identification Data:

First Name:	Middle Name:	Last Name:
Nick Name:	Date of Birth:	Gender:
Ethnicity:		
Main language spoken at home:		

2. Child's Education Data:

Please indicate when your child started school

Year:	Month:	Date:

3. Name of School child attend

4. Information on Education:

Does your child attend one of the following education placements?

(Please tick any that presently apply)

Regular class in regular school	
Special class in regular school	
Special school	

5. Responded Details:

Please tick in the correct column your relationship to child.

Relationship to child	
Biological	
Adoptive parent	
Grandparents	
Foster parent	
Uncle/Aunt	
Sibling	
Other, please specify	

6. Level of Education of Parents/Guardian

	Mother	Father	Guardian
Primary School Completed			
Primary school Uncompleted			
Secondary School Completed			
Secondary School Uncompleted			
Tertiary Education Completed			
Tertiary Education Uncompleted			
No formal school training			

SECTION B Diagnostic History

7. Was your child diagnosed with Autism by a Health Professional/educational Phycologist

Yes	No

8. If yes, who diagnosed your child?

9. If known indicate the level of Autism:

Autistic Disorder	
Asperger's Disorder	
Pervasive Developmental Disorder	

10. Indicate the date of your child's diagnosis?

Date of Diagnosis	
-------------------	--

11. Please indicate which of the following symptoms your child is CURRENTLY experiencing:

Symptoms	
----------	--

Social Communication	
Challenges Non-verbal	
Challenges Verbal	
Speak using unusual volume, pitch, intonation, rate, or rhythm	
Use odd language or repeat the same things over and over again	
Find it difficult to hold a two-way conversation	
Find it difficult to explain how they feel using words, expressions, tone of voice, and gestures	
Social Interaction	
Don't make eye contact	
Don't respond to their name being called	
Unaware of social conventions/appropriate social behavior.	
Unconcerned to physical contact and affection - not like being hugged.	
Do not try to make friends or would like to make friends	
Restricted, repetitive patterns of behavior, interests, or activities	
Have an overwhelming interest in something.	
Stick to specific routines or rituals.	
Repeat the same movements, such as flapping their hands.	
Hypersensitive to certain sounds, such as telephones	
Please specify other symptoms	

12. Speech Milestone: Indicate the age in months at which your child reached the milestones below.

Communication Milestones	Month Occurred
First speech like sounds	
First time said “mama” or “dada”	
First words besides “mamma/dada”	
First time words used to specifically refer to something	
First time put words together in phrase	
First time pointed to something he/she wanted	
First time pointed to something to show interested	

13. Motor Milestones: Indicate the age in months at which your child reached the milestones below.

Motor Milestones	Month Occurred
Roll over	
Sitting without support	
Crawling	
Creeping/cruising “leopard crawling”	

Standing independently	
Walking independently	

SECTION B Pharmaceuticals and Supplement-Based Treatments

14. Pharmaceuticals:

Please list all medications that your child is CURRENTLY taking:

15. Current Complementary, Alternative Treatments, Pharmaceutical and Supplement-based Treatments:

Tick only complete information on complementary and alternative supplement your child is CURRENTLY taking:

Supplement-Based	
Vitamins	
Vitamin A	
Vitamin B	
Vitamin C	
Vitamin D	
Vitamin D	
Vitamin E	
Antioxidants	
Mitochondrial Supplements	
Nutritional Supplements	
Minerals	

Calcium	
Iron	
Magnesium	
Zinc	
Gastrointestinal Supplements	
Multi Vitamin	
Other – please specify	

Appendix E



“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”

CHILD PARTICIPATION IN INTERVENTION CONSENT (Parent/Guardian)

Title: *“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”*

1. I am aware that Chantell Gouws from the Department of Human Movement Science, University of Zululand has requested my permission to allow my child to participate in the above-mentioned research project.
2. The nature and the purpose of the research project and of this informed consent declaration have been explained to me in a language that I understand.
3. I am aware that the purpose of the research project is to investigate if various treatments and activities and efficacy of a communication intervention.
4. The University of Zululand has given ethical clearance to this research project and I have seen/ may request to see the clearance certificate.

-
5. By participating in this research project my child will be contributing towards better understanding of the efficacy of intervention on communication.
 6. My child's participation is entirely voluntary.
 7. Should I or my child at any stage wish to withdraw my child from participating further, we may do so without any negative consequences on us as participant.
 8. My child may be asked to withdraw from the research before it has finished if the researcher or any other appropriate person feels it is in my child's best interests, or if my child does not follow instructions.
 9. Neither my child nor I will be compensated for participating in the research.
 10. The researcher intends publishing the research results in the form of articles. However, confidentiality and anonymity of records will be maintained and that my or my child's name and identity will not be revealed to anyone who has not been involved in the conduct of the research.
 11. I will receive feedback in the form of an email regarding the results obtained during the study.
 12. Any further questions that I might have concerning the research or my participation will be answered by Chantell Gouws 082 2595 191.
 13. By signing this informed consent declaration, I am not waiving any legal claims, rights or remedies that I or my child/ward may have.
 14. A copy of this informed consent declaration will be given to me, and the original will be kept on record.

I..... have read the above information / confirm that the above information has been explained to me in a

language that I understand and I am aware of this document's contents. I have asked all questions that I wished to ask and these have been answered to my satisfaction. I fully understand what is expected of my child/ward during the research.

I have not been pressurized in any way to let my child/ward take part. By signing below, I voluntarily agree that my child, who is year's old, may participate in the above-mentioned research project.

.....
Parent/Guardian's signature

.....
Date

Appendix F



*“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder
and the Efficacy of selected Interventions on Social Communication”*

INFORMED CONSENT DECLARATION

(Child participant)

(Acknowledge reference to Stellenbosch and Fort Hare)



Project Title: (Simplify it if necessary)

Researcher's name:

Name of participant:

1. Has the researcher explained what s/he will be doing and wants you to do?

YES

NO

2. Has the researcher explained why s/he wants you to take part?

YES

NO

3. Do you understand what the research wants to do?

YES

NO

4. Do you know if anything good or bad can happen to you during the research?

YES

NO

5. Do you know that your name and what you say will be kept a secret from other people?

YES

NO

6. Did you ask the researcher any questions about the research?

YES

NO

7. Has the researcher answered all your questions?

YES

NO

8. Do you understand that you can refuse to participate if you do not want to take part and that nothing will happen to you if you refuse?

YES

NO

9. Do you understand that you may pull out of the study at any time if you no longer want to continue?

YES

NO

10. Do you know who to talk to if you are worried or have any other questions to ask?

YES

NO

11. Has anyone forced or put pressure on you to take part in this research?

YES

NO

12. Are you willing to take part in the research?

YES

NO

Signature of Child

Date



Okwaziswe imvume yesimemezelo

(Ukuhlanganyela komtwana)

(Ukuvuma nokudluliselwa kwe-Stellenbosch kanye ne-Fort Hare)



Igama lomsebenzi:(Chaza kube sobala uma kunesidingo)

Igama lomcwaningi:

Igamalomhlanganyeli:

1. Ingabe umcwaningi uchazile ukuthi uzobe enzani nokuthi udinga wena ukuba wenzeni?

YEBO

CHA

2. Ingabe umcwaningi uchazile ukuthi kungani efuna ukuba wena ubambe iqhaza?

YEBO

CHA

3. Ingabe uyaqonda ukuthi ngabe ucwaningo likudinga ukuba wenzeni?

YEBO

CHA

-
4. Ngabe uyazi uma kukhona into enhle noma embi engase yenzeke ngesikhathi sokwenziwa kocwaningo?

YEBO

CHA

5. Ngabe uyazi ukuthi igama lakho kanye nokushoyo ukuthi kuzoba imfihlo engeke idalulwe kwabanye abantu?

YEBO

CHA

6. Ingabe uke wamubuza umcwaningi noma imiphi imibuzo mayelana nocwaningo?

YEBO

CHA

7. Ingabe umcwaningi uyiphendulile imibuzo yakho?

YEBO

CHA

8. Ingabe uyakuqonda ukuthi unelungelo lokunqaba ukubamba iqhaza uma ungafuni ukuba ingxenye nokuthi ayikho into ezokwenzeka kuwena uma wenqaba?

YEBO

CHA

9. Ingabe uyakuqonda ukuthi ungayeka noma inini ngesikhathi socwaningo uma ubona ukuthi ngeke wakwazi ukuqhubeka?

YEBO

CHA

10. Ingabe uyazi ukuthi ngubani ongakhuluma naye uma uxakekile noma uneminye imibuzo ofuna ukuyibuza?

YEBO

CHA

11. Ingabe ukhona okuphoqile noma wabeka ingcindezelo phezu kwakho ukuba ubambe iqhaza kulolucwaningo?

YEBO

CHA

12. Ingabe uyafuna ngempela ukubamba iqhaza kulolucwaningo?

YEBO

CHA

Ukusayina komtwana



Usuku



Appendix G



*“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder
and the Efficacy of selected Interventions on Social Communication”*

INFORMED CONSENT CHECKLIST

(Child participant)

(Acknowledge reference to Stellenbosch)

Project Title:

Researcher's name:

ADDRESS:

CONTACT NUMBER:

What is RESEARCH?

Research is something we do to find new knowledge about the way things (and people) work. We use research projects or studies to help us find out more about things such as Autism. Research also helps us to find better ways of doing things or helping or treating people.

What is this research project all about?

Explain your project in simple child friendly language. Adapt the information to the age of the children that you plan to include.

The duration of the research project?

Explain what is going to happen and the expected duration

Why have I been invited to take part in this research project?

Answer this question in simple language

Confidentiality

Explain the procedure and need for confidentiality

If a sponsor is to be involved

Explain potential conflict of interest

Who is doing the research?

Identify yourself and explain who you work for and/or why you are doing the project

What will happen to me in this study?

Describe what the participant will be expected to do. Describe all procedures using simple terms and explain any technical or medical terms.

Can anything bad happen to me?

Explain any possible risks to the child, using simple terms. If something might be painful, state this in the assent. Explain that the child should inform his/her parents if they are sick or in pain as a result of being in the study.

Who else is involved in the study?

Explain the number of participants and where they are from

Can anything good happen to me?

Only describe known benefits to the subject. You may include any possible future benefits to others. If there are no known benefits, state so.

Will anyone know I am in the study?

Explain in simple terms that the subject's participation in the study will be kept confidential, but information about him/her will be given to the study sponsor. (NOTE: This information may not be applicable in assent forms for very young children).

Who can I talk to about the study? *List those individuals the subject can contact (including their contact details) if he/she has any questions or has any problems related to the study.*

What if I do not want to do this?

Explain to the participant that he/she can refuse to take part even if their parents have agreed to their participation. Explain that they can stop being in the study at any time without getting in trouble.

Appendix H



*“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder
and the Efficacy of selected Interventions on Social Communication”*

SOCIAL COMMUNICATION OBSERVATION SHEET

Items for Observation	Comments
Prosody of Speech	
Ability to make use of descriptive language	
Prompt by Tutor	
Non-verbal Physical Reaction	
Cooperation in answering of questions	
Eye Contact with Tutor	
Reciprocity/Interactivity	
Ability to initiate conversation	
Use of verbal communication	
Use of echolalia	
Use of body language to support verbal language	
Use of Language	
Coherence (consistency/reasoning) of sentence	
Keeping to the topic	
Use the object for something else	
Ability to make use of descriptive language	
Use of abstract humor	

Appendix I



“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”

Ethical Clearance Certificate

**UNIVERSITY OF ZULULAND
RESEARCH ETHICS COMMITTEE**
(Reg No: UZREC 171110-030)



RESEARCH & INNOVATION
Website: <http://www.umzulu.ac.za>
Private Bag X1001
KwaDlangezwa 3886
Tel: 035 902 6887
Fax: 035 902 6222
Email: ManqeleS@umzulu.ac.za

ETHICAL CLEARANCE CERTIFICATE

Certificate Number	UZREC 171110-030 PGD 2016/149				
Project Title	Treatments and activities of children in KZN with Autistic Spectrum Disorder and the efficacy of an intervention on communication skills				
Principal Researcher/ Investigator	C Gouws				
Supervisor and Co-supervisor	Dr CJ du Preez		Dr S Govender		
Department	Biokenetics and Sports Science				
Nature of Project	Honours/4 th Year		Master's	Doctoral	<input checked="" type="checkbox"/> x Departmental

The University of Zululand's Research Ethics Committee (UZREC) hereby gives ethical approval in respect of the undertakings contained in the above-mentioned project proposal and the documents listed on page 2 of this Certificate.

Special conditions: (1) This certificate is valid for 3 years from the date of issue.
(2) Principal researcher must provide an annual report to the UZREC in the prescribed format [due date-31 August 2017]
(3) Principal researcher must submit a report at the end of project in respect of ethical compliance.

The Researcher may therefore commence with the research as from the date of this Certificate, using the reference number indicated above, but may not conduct any data collection using research instruments that are yet to be approved.

Please note that the UZREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the documents that were presented to the UZREC
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

Classification:

Data collection	Animals	Human Health	Children	Vulnerable pp.	Other
X			X		
Low Risk		Medium Risk		High Risk	
				X	

The table below indicates which documents the UZREC considered in granting this Certificate and which documents, if any, still require ethical clearance. (Please note that this is not a closed list and should new instruments be developed, these would require approval.)

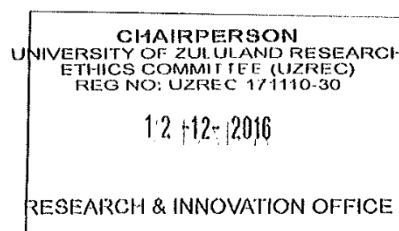
Documents	Considered	To be submitted	Not required
Faculty Research Ethics Committee recommendation	X		
Animal Research Ethics Committee recommendation			X
Health Research Ethics Committee recommendation			X
Ethical clearance application form	X		
Project registration proposal	X		
Informed consent from participants	X		
Informed consent from parent/guardian	X		
Permission for access to sites/information/participants	X		
Permission to use documents/copyright clearance			X
Data collection/survey instrument/questionnaire	X		
Data collection instrument in appropriate language		Only if necessary	
Other data collection instruments		Only if used	

The UZREC retains the right to

- Withdraw or amend this Certificate if
 - Any unethical principles or practices are revealed or suspected
 - Relevant information has been withheld or misrepresented
 - Regulatory changes of whatsoever nature so require
 - The conditions contained in this Certificate have not been adhered to
- Request access to any information or data at any time during the course or after completion of the project

The UZREC wishes the researcher well in conducting the research


 Professor Gideon De Wet
 Chairperson: University Research Ethics Committee
 Deputy Vice-Chancellor: Research & Innovation
 12 December 2016



Appendix J



“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”

Proof/Submission for Publications

Chantell Gouws

From: HealthMED Journal <healthmedjournal@gmail.com>
Sent: Monday, 15 October 2018 5:09 PM
To: Chantell Gouws
Subject: Re: Submission form on HealthMED

Dear Author,
it is pleasure to inform you that your manuscript
"Role of Sensory Integration Therapy in Sensory Processing Disorder in Children with Autism
Spectrum Disorder"
is accepted for publish.
Please make yours fee payment (see [www. healthmed.ba](http://www.healthmed.ba))

on the account:

ACCOUNT WITH INST.: NOVA BANKA AD BANJA LUKA
SWIFT CODE: NOBIBA22
ADDRESS: Strossmayerova bb
71 000 Sarajevo,
Bosnia and Herzegovina

DETAILS OF BENEFICIARY:

IBAN CODE: BA 395552601004838505
FULL BENEFICIARY NAME: MENSURA KUDUMOVIC
FULL BENEFICIARY ADDRESS: GRBAVICKA 8A SARAJEVO, BiH
and send proof payment.

or:
You can pay using WesternUnion or MoneyGram:

First name: Mensura
Last name: Kudumovic
Address: Grbavicka 8A, Sarajevo
Postal code: 71000
Country: Bosnia and Herzegovina

and send MTCN

Regards,
HealthMED Journal

Appendix K



“Treatments, Therapies and Activities in Learners with Autism Spectrum Disorder and the Efficacy of selected Interventions on Social Communication”

Short Sensory Profile & Sensory Processing Disorder Checklist



The Influence of Sensory Integration on Behavior, Cognition and Mood in Autistic Children.

Short Sensory Profile

SENSORY PROFILE
Wendy C. Oatis, PhD, OTR, FAOTA

Name: _____ Surname: _____
Age: _____ Tutor: _____
Day: MTWTF Time: _____

INSTRUCTIONS

Please check the box that best describes the frequency with which your child does the following behaviors. Please answer all of the statements. If you are unable to comment because you have not observed the behavior or believe that it does not apply to your child, please draw an X through the number for that item. Please do not write in the Section Raw Score Total row.

Use the following key to mark your responses:

ALWAYS	When presented with the opportunity, your child always responds in this manner, 100% of the time.
FREQUENTLY	When presented with the opportunity, your child frequently responds in this manner, about 75% of the time.
OCCASIONALLY	When presented with the opportunity, your child occasionally responds in this manner, about 25% of the time.
NEVER	When presented with the opportunity, your child never responds in this manner, 0% of the time.

Item	1	2	3	4	5	6	7	Section Raw Score Total
Section 1: Tactile Sensitivity								
1 Expresses disgust during grooming (for example, flinches or cries during hair cutting, face washing, fingernail cutting)								
2 Prefers long-sleeved clothing when it is warm or short sleeves when it is cold								
3 Avoids going barefoot, especially in sand or grass								
4 Reacts immediately or aggressively to touch								
5 Withdraws from splashing water								
6 Has difficulty standing in line or close to other people								
7 Rubs or scratches out a spot that has been touched								
Section 2: Taste/Smell Sensitivity								
8 Avoids certain tastes or food smells that are typically part of child's diet								
9 Will only eat certain tastes (for example, only sweet)								
10 Limits self to particular food textures/temperatures (for example, only soft)								
11 Picky eater, especially regarding food textures								
Section 3: Movement Sensitivity								
12 Becomes anxious or distressed when feet leave the ground								
13 Fears falling or heights								
14 Dislikes activities where head is upside down (for example, somersaults, roughhousing)								
Section 4: Underresponsive/Reactive Sensation								
15 Enjoys strong noises/sounds to make noise for noise's sake								
16 Seeks all kinds of movement and this interferes with early routines (for example, can't sit still, fidgets)								
17 Becomes overly excited during movement activity								
18 Touches people and objects								
19 Doesn't seem to notice when face or hands are messy								
20 Jumps from a toy slowly to another so that it interferes with play								
21 Leaves clothing twisted on body								

0781639121

Item		ALWAYS	FREQUENTLY	OCCASIONALLY	SELDOM	NEVER
Auditory Filtering						
22	Is distracted or has trouble functioning if there is a lot of noise around					
23	Appears to not hear what you say (for example, does not "tune-in" to what you say, appears to ignore you)					
24	Can't work with background noise (for example, fan, refrigerator)					
25	Has trouble completing tasks when the radio is on					
26	Doesn't respond when name is called but you know the child's hearing is OK					
27	Has difficulty paying attention					
Section Raw Score Total						
Low Energy/Weak						
28	Seems to have weak muscles					
29	Tires easily, especially when standing or holding particular body position					
30	Has a weak grasp					
31	Can't lift heavy objects (for example, weak in comparison to same age children)					
32	Props to support self (even during activity)					
33	Poor endurance/tires easily					
Section Raw Score Total						
Visual/Auditory Sensitivity						
34	Responds negatively to unexpected or loud noises (for example, cries or hides at noise from vacuum cleaner, dog barking, hair dryer)					
35	Holds hands over ears to protect ears from sound					
36	Is bothered by bright lights after others have adapted to the light					
37	Watches everyone when they move around the room					
38	Covers eyes or squints to protect eyes from light					
Section Raw Score Total						

FOR OFFICE USE ONLY

Summary

Instructions: Transfer the score for each section to the Section Raw Score column. Plot these totals by marking an X in the appropriate classification column (Typical Performance, Probable Difference, Definite Difference).

SCORE KEY

1 = Always 4 = Seldom
2 = Frequently 5 = Never
3 = Occasionally

Section	Section Raw Score Total	Typical Performance	Probable Difference	Definite Difference
Tactile Sensitivity	/35	35 ----- 30	29 ----- 27	26 ----- 7
Taste/Smell Sensitivity	/20	20 ----- 15	14 ----- 12	11 ----- 4
Movement Sensitivity	/15	15 ----- 13	12 ----- 11	10 ----- 3
Underresponsive/Seeks Sensation	/35	35 ----- 27	28 ----- 24	23 ----- 7
Auditory Filtering	/30	30 ----- 23	22 ----- 20	19 ----- 6
Low Energy/Weak	/30	30 ----- 26	25 ----- 24	23 ----- 6
Visual/Auditory Sensitivity	/25	25 ----- 19	18 ----- 16	15 ----- 6
Total	/190	190 ----- 155	154 ----- 142	141 ----- 38

*Classifications are based on the performance of children without disabilities (n = 1,037).

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A Harcourt Assessment Company

9 10 11 12 A B C D E

0761638189

Tactile Sense

Input from the skin receptors about touch, pressure, temperature, pain, and movement of the hairs on the skin.

Signs of Tactile Dysfunction:

1. Hypersensitivity To Touch (Tactile Defensiveness)

- ☐ becomes fearful, anxious or aggressive with light or unexpected touch
- ☐ as an infant, did/does not like to be held or cuddled; may arch back, cry, and pull away
- ☐ distressed when diaper is being, or needs to be, changed
- ☐ appears fearful of, or avoids standing in close proximity to other people or peers (especially in lines)
- ☐ becomes frightened when touched from behind or by someone/something they can not see (such as under a blanket)
- ☐ complains about having hair brushed; may be very picky about using a particular brush
- ☐ bothered by rough bed sheets (i.e., if old and "bumpy")
- ☐ avoids group situations for fear of the unexpected touch
- ☐ resists friendly or affectionate touch from anyone besides parents or siblings (and sometimes them too!)
- ☐ dislikes kisses, will "wipe off" place where kissed
- ☐ prefers hugs
- ☐ a raindrop, water from the shower, or wind blowing on the skin may feel like torture and produce adverse and avoidance reactions
- ☐ may overreact to minor cuts, scrapes, and or bug bites
- ☐ avoids touching certain textures of material (blankets, rugs, stuffed animals)
- ☐ refuses to wear new or stiff clothes, clothes with rough textures, turtlenecks, jeans, hats, or belts, etc.
- ☐ avoids using hands for play

-
- ___ avoids/dislikes/aversive to "messy play", i.e., sand, mud, water, glue, glitter, playdoh, slime, shaving cream/funny foam etc.
 - ___ will be distressed by dirty hands and want to wipe or wash them frequently
 - ___ excessively ticklish
 - ___ distressed by seams in socks and may refuse to wear them
 - ___ distressed by clothes rubbing on skin; may want to wear shorts and short sleeves year round, toddlers may prefer to be naked and pull diapers and clothes off constantly
 - ___ or, may want to wear long sleeve shirts and long pants year round to avoid having skin exposed
 - ___ distressed about having face washed
 - ___ distressed about having hair, toenails, or fingernails cut
 - ___ resists brushing teeth and is extremely fearful of the dentist
 - ___ is a picky eater, only eating certain tastes and textures; mixed textures tend to be avoided as well as hot or cold foods; resists trying new foods
 - ___ may refuse to walk barefoot on grass or sand
 - ___ may walk on toes only

2. Hyposensitivity To Touch (Under-Responsive):

- ___ may crave touch, needs to touch everything and everyone
 - ___ is not aware of being touched/bumped unless done with extreme force or intensity
 - ___ is not bothered by injuries, like cuts and bruises, and shows no distress with shots (may even say they love getting shots!)
 - ___ may not be aware that hands or face are dirty or feel his/her nose running
 - ___ may be self-abusive; pinching, biting, or banging his own head
 - ___ mouths objects excessively
 - ___ frequently hurts other children or pets while playing
 - ___ repeatedly touches surfaces or objects that are soothing (i.e., blanket)
 - ___ seeks out surfaces and textures that provide strong tactile feedback
 - ___ thoroughly enjoys and seeks out messy play
 - ___ craves vibrating or strong sensory input
 - ___ has a preference and craving for excessively spicy, sweet, sour, or salty foods
-

3. Poor Tactile Perception and Discrimination:

- ___ has difficulty with fine motor tasks such as buttoning, zipping, and fastening clothes
 - ___ may not be able to identify which part of their body was touched if they were not looking
 - ___ may be afraid of the dark
 - ___ may be a messy dresser; looks disheveled, does not notice pants are twisted, shirt is half un tucked, shoes are untied, one pant leg is up and one is down, etc.
 - ___ has difficulty using scissors, crayons, or silverware
 - ___ continues to mouth objects to explore them even after age two
 - ___ has difficulty figuring out physical characteristics of objects; shape, size, texture, temperature, weight, etc.
 - ___ may not be able to identify objects by feel; uses vision to help; such as, reaching into backpack or desk to retrieve an item
-

Vestibular Sense

input from the inner ear about equilibrium, gravitational changes, movement experiences, and position in space.

Signs Of Vestibular Dysfunction:

1. Hypersensitivity To Movement (Over-Responsive):

- ☐ avoids/dislikes playground equipment; i.e., swings, ladders, slides, or merry-go-rounds
- ☐ prefers sedentary tasks, moves slowly and cautiously, avoids taking risks, and may appear "wimpy"
- ☐ avoids/dislikes elevators and escalators; may prefer sitting while they are on them or, actually get motion sickness from them
- ☐ may physically cling to an adult they trust
- ☐ may appear terrified of falling even when there is no real risk of it
- ☐ afraid of heights, even the height of a curb or step
- ☐ fearful of feet leaving the ground
- ☐ fearful of going up or down stairs or walking on uneven surfaces
- ☐ afraid of being tipped upside down, sideways or backwards; will strongly resist getting hair washed over the sink
- ☐ startles if someone else moves them; i.e., pushing his/her chair closer to the table
- ☐ as an infant, may never have liked baby swings or jumpers
- ☐ may be fearful of, and have difficulty riding a bike, jumping, hopping, or balancing on one foot (especially if eyes are closed)
- ☐ may have disliked being placed on stomach as an infant
- ☐ loses balance easily and may appear clumsy
- ☐ fearful of activities which require good balance
- ☐ avoids rapid or rotating movements

2. Hyposensitivity To Movement (Under-Responsive):

- ☐ in constant motion, can't seem to sit still

-
- ☐ craves fast, spinning, and/or intense movement experiences
 - ☐ loves being tossed in the air
 - ☐ could spin for hours and never appear to be dizzy
 - ☐ loves the fast, intense, and/or scary rides at amusement parks
 - ☐ always jumping on furniture, trampolines, spinning in a swivel chair, or getting into upside down positions
 - ☐ loves to swing as high as possible and for long periods of time
 - ☐ is a "thrill-seeker"; dangerous at times
 - ☐ always running, jumping, hopping etc. instead of walking
 - ☐ rocks body, shakes leg, or head while sitting
 - ☐ likes sudden or quick movements, such as, going over a big bump in the car or on a bike

3. Poor Muscle Tone And/Or Coordination:

- ☐ has a limp, "floppy" body
 - ☐ frequently slumps, lies down, and/or leans head on hand or arm while working at his/her desk
 - ☐ difficulty simultaneously lifting head, arms, and legs off the floor while lying on stomach ("superman" position)
 - ☐ often sits in a "W sit" position on the floor to stabilize body
 - ☐ fatigues easily!
 - ☐ compensates for "looseness" by grasping objects tightly
 - ☐ difficulty turning doorknobs, handles, opening and closing items
 - ☐ difficulty catching him/her self if falling
 - ☐ difficulty getting dressed and doing fasteners, zippers, and buttons
 - ☐ may have never crawled as an baby
 - ☐ has poor body awareness; bumps into things, knocks things over, trips, and/or appears clumsy
 - ☐ poor gross motor skills; jumping, catching a ball, jumping jacks, climbing a ladder etc.
 - ☐ poor fine motor skills; difficulty using "tools", such as pencils, silverware, combs, scissors etc.
 - ☐ may appear ambidextrous, frequently switching hands for coloring, cutting, writing
-

etc.; does not have an established hand preference/dominance by 4 or 5 years old

___ has difficulty licking an ice cream cone

___ seems to be unsure about how to move body during movement, for example,
stepping over something

___ difficulty learning exercise or dance steps

Proprioceptive Sense

Input from the muscles and joints about body position, weight, pressure, stretch, movement, and changes in position in space.

Signs Of Proprioceptive Dysfunction:

1. Sensory Seeking Behaviors:

- ☐ seeks out jumping, bumping, and crashing activities
- ☐ stomps feet when walking
- ☐ kicks his/her feet on floor or chair while sitting at desk/table
- ☐ bites or sucks on fingers and/or frequently cracks his/her knuckles
- ☐ loves to be tightly wrapped in many or weighted blankets, especially at bedtime
- ☐ prefers clothes (and belts, hoods, shoelaces) to be as tight as possible
- ☐ loves/seeks out "squishing" activities
- ☐ enjoys bear hugs
- ☐ excessive banging on/with toys and objects
- ☐ loves "roughhousing" and tackling/wrestling games
- ☐ frequently falls on floor intentionally
- ☐ would jump on a trampoline for hours on end
- ☐ grinds his/her teeth throughout the day
- ☐ loves pushing/pulling/dragging objects
- ☐ loves jumping off furniture or from high places
- ☐ frequently hits, bumps or pushes other children
- ☐ chews on pens, straws, shirt sleeves etc.

2. Difficulty With "Grading Of Movement":

- ☐ misjudges how much to flex and extend muscles during tasks/activities (i.e., putting arms into sleeves or climbing)
- ☐ difficulty regulating pressure when writing/drawing; may be too light to see or so

hard the tip of writing utensil breaks

___ written work is messy and he/she often rips the paper when erasing

___ always seems to be breaking objects and toys

___ misjudges the weight of an object, such as a glass of juice, picking it up with too much force sending it flying or spilling, or with too little force and complaining about objects being too heavy

___ may not understand the idea of "heavy" or "light"; would not be able to hold two objects and tell you which weighs more

___ seems to do everything with too much force; i.e., walking, slamming doors, pressing things too hard, slamming objects down

___ plays with animals with too much force, often hurting them

Signs of Auditory Dysfunction

(No diagnosed hearing problem)

1. Hypersensitivity To Sounds (Auditory Defensiveness):

- ☐ ___ distracted by sounds not normally noticed by others; i.e., humming of lights or refrigerators, fans, heaters, or clocks ticking
- ☐ ___ fearful of the sound of a flushing toilet (especially in public bathrooms), vacuum, hairdryer, squeaky shoes, or a dog barking
- ☐ ___ started with or distracted by loud or unexpected sounds
- ☐ ___ bothered/distracted by background environmental sounds; i.e., lawn mowing or outside construction
- ☐ ___ frequently asks people to be quiet; i.e., stop making noise, talking, or singing
- ☐ ___ runs away, cries, and/or covers ears with loud or unexpected sounds
- ☐ ___ may refuse to go to movie theaters, parades, skating rinks, musical concerts etc.
- ☐ ___ may decide whether they like certain people by the sound of their voice

2. Hyposensitivity To Sounds (Under-Registers):

- ☐ ___ often does not respond to verbal cues or to name being called
 - ☐ ___ appears to "make noise for noise's sake"
 - ☐ ___ loves excessively loud music or TV
 - ☐ ___ seems to have difficulty understanding or remembering what was said
 - ☐ ___ appears oblivious to certain sounds
 - ☐ ___ appears confused about where a sound is coming from
 - ☐ ___ talks self through a task, often out loud
 - ☐ ___ had little or no vocalizing or babbling as an infant
 - ☐ ___ needs directions repeated often, or will say, "What?" frequently
-

Signs of Oral Input Dysfunction

1. Hypersensitivity to Oral Input (Oral Defensiveness):

- ☐ picky eater, often with extreme food preferences; i.e., limited repertoire of foods, picky about brands, resistive to trying new foods or restaurants, and may not eat at other people's houses)
- ☐ may only eat "soft" or pureed foods past 24 months of age
- ☐ may gag with textured foods
- ☐ has difficulty with sucking, chewing, and swallowing; may choke or have a fear of choking
- ☐ resists/refuses/extremely fearful of going to the dentist or having dental work done
- ☐ may only eat hot or cold foods
- ☐ refuses to lick envelopes, stamps, or stickers because of their taste
- ☐ dislikes or complains about toothpaste and mouthwash
- ☐ avoids seasoned, spicy, sweet, sour or salty foods; prefers bland foods

2. Hyposensitivity to Oral Input (Under-Registers)

- ☐ may lick, taste, or chew on inedible objects
 - ☐ prefers foods with intense flavour; i.e., excessively spicy, sweet, sour, or salty
 - ☐ excessive drooling past the teething stage
 - ☐ frequently chews on hair, shirt, or fingers
 - ☐ constantly putting objects in mouth past the toddler years
 - ☐ acts as if all foods taste the same
 - ☐ can never get enough condiments or seasonings on his/her food
 - ☐ loves vibrating toothbrushes and even trips to the dentist
-

Signs of Olfactory Dysfunction

(Smells)

1. Hypersensitivity To Smells (Over-Responsive):

- ☐ reacts negatively to, or dislikes smells which do not usually bother, or get noticed, by other people
- ☐ tells other people (or talks about) how bad or funny they smell
- ☐ refuses to eat certain foods because of their smell
- ☐ offended and/or nauseated by bathroom odours or personal hygiene smells
- ☐ bothered/irritated by smell of perfume or cologne
- ☐ bothered by household or cooking smells
- ☐ may refuse to play at someone's house because of the way it smells
- ☐ decides whether he/she likes someone or some place by the way it smells

2. Hyposensitivity To Smells (Under-Responsive):

- ☐ has difficulty discriminating unpleasant odours
 - ☐ may drink or eat things that are poisonous because they do not notice the noxious smell
 - ☐ unable to identify smells from scratch 'n sniff stickers
 - ☐ does not notice odours that others usually complain about
 - ☐ fails to notice or ignores unpleasant odours
 - ☐ makes excessive use of smelling when introduced to objects, people, or places
 - ☐ uses smell to interact with objects
-

Signs Of Visual Input Dysfunction

(No Diagnosed Visual Deficit)

1. Hypersensitivity to Visual Input (Over-Responsiveness)

- ☐ sensitive to bright lights; will squint, cover eyes, cry and/or get headaches from the light
- ☐ has difficulty keeping eyes focused on task/activity he/she is working on for an appropriate amount of time
- ☐ easily distracted by other visual stimuli in the room; i.e., movement, decorations, toys, windows, doorways etc.
- ☐ has difficulty in bright colourful rooms or a dimly lit room
- ☐ rubs his/her eyes, has watery eyes or gets headaches after reading or watching TV
- ☐ avoids eye contact
- ☐ enjoys playing in the dark

2. Hyposensitivity to Visual Input (Under-Responsive Or Difficulty With Tracking, Discrimination, Or Perception):

- ☐ has difficulty telling the difference between similar printed letters or figures; i.e., p & q, b & d, + and x, or square and rectangle
- ☐ has a hard time seeing the "big picture"; i.e., focuses on the details or patterns within the picture
- ☐ has difficulty locating items among other items; i.e., papers on a desk, clothes in a drawer, items on a grocery shelf, or toys in a bin/toy box
- ☐ often loses place when copying from a book or the chalkboard
- ☐ difficulty controlling eye movement to track and follow moving objects
- ☐ has difficulty telling the difference between different colors, shapes, and sizes
- ☐ often loses his/her place while reading or doing math problems
- ☐ makes reversals in words or letters when copying, or reads words backwards; i.e., "was" for "saw" and "no" for "on" after first grade
- ☐ complains about "seeing double"

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- ___ Difficulty finding differences in pictures, words, symbols, or objects
 - ___ Difficulty with consistent spacing and size of letters during writing and/or lining up numbers in math problems
 - ___ Difficulty with jigsaw puzzles, copying shapes, and/or cutting/tracing along a line
 - ___ tends to write at a slant (up or down hill) on a page
 - ___ confuses left and right
 - ___ fatigues easily with schoolwork
 - ___ Difficulty judging spatial relationships in the environment; i.e., bumps into objects/people or missteps on curbs and stairs
-

Auditory Language Processing Dysfunction

- ___ unable to locate the source of a sound
 - ___ difficulty identifying people's voices
 - ___ difficulty discriminating between sounds/words; i.e., "dare" and "dear"
 - ___ difficulty filtering out other sounds while trying to pay attention to one person talking
 - ___ bothered by loud, sudden, metallic, or high-pitched sounds
 - ___ difficulty attending to, understanding, and remembering what is said or read; often asks for directions to be repeated and may only be able to understand or follow two sequential directions at a time
 - ___ looks at others to/for reassurance before answering
 - ___ difficulty putting ideas into words (written or verbal)
 - ___ often talks out of turn or "off topic"
 - ___ if not understood, has difficulty re-phrasing; may get frustrated, angry, and give up
 - ___ difficulty reading, especially out loud (may also be dyslexic)
 - ___ difficulty articulating and speaking clearly
 - ___ ability to speak often improves after intense movement
-

Social Emotional Play And Self Regulation Dysfunction:

Social:

- ☐ difficulty getting along with peers
- ☐ prefers playing by self with objects or toys rather than with people
- ☐ does not interact reciprocally with peers or adults; hard to have a "meaningful" two-way conversation
- ☐ self-abusive or abusive to others
- ☐ others have a hard time interpreting child's cues, needs, or emotions
- ☐ does not seek out connections with familiar people

Emotional:

- ☐ difficulty accepting changes in routine (to the point of tantrums)
- ☐ gets easily frustrated
- ☐ often impulsive
- ☐ functions best in small group or individually
- ☐ variable and quickly changing moods; prone to outbursts and tantrums
- ☐ prefers to play on the outside, away from groups, or just be an observer
- ☐ avoids eye contact
- ☐ difficulty appropriately making needs known

Play:

- ☐ difficulty with imitative play (over 10 months)
- ☐ wanders aimlessly without purposeful play or exploration (over 15 months)
- ☐ needs adult guidance to play, difficulty playing independently (over 18 months)
- ☐ participates in repetitive play for hours; i.e., lining up toys cars, blocks, watching one movie over and over etc.

Self-Regulation:

- ☐ excessive irritability, fussiness or colic as an infant
- ☐ can't calm or soothe self through pacifier, comfort object, or caregiver
- ☐ can't go from sleeping to awake without distress
- ☐ requires excessive help from caregiver to fall asleep; i.e., rubbing back or head, rocking, long walks, or car rides

Internal Regulation (The Interoceptive Sense):

- ☐ becoming too hot or too cold sooner than others in the same environments; may not appear to ever get cold/hot, may not be able to maintain body temperature effectively
- ☐ difficulty in extreme temperatures or going from one extreme to another (i.e., winter, summer, going from air conditioning to outside heat, a heated house to the cold outside)
- ☐ respiration that is too fast, too slow, or cannot switch from one to the other easily as the body demands an appropriate respiratory response
- ☐ heart rate that speeds up or slows down too fast or too slow based on the demands imposed on it
- ☐ respiration and heart rate that takes longer than what is expected to slow down during or after exertion or fear
- ☐ severe/several mood swings throughout the day (angry to happy in short periods of time, perhaps without visible cause)
- ☐ unpredictable state of arousal or inability to control arousal level (hyper to lethargic, quickly, vacillating between the two; over stimulated to under stimulated, within hours or days, depending on activity and setting, etc.)
- ☐ frequent constipation or diarrhea, or mixed during the same day or over a few days
- ☐ difficulty with potty training; does not seem to know when he/she has to go (i.e., cannot feel the necessary sensation that bowel or bladder are full)
- ☐ unable to regulate thirst; always thirsty; never thirsty, or oscillates back and forth
- ☐ unable to regulate hunger; eats all the time, won't eat at all, unable to feel full/hungry
- ☐ unable to regulate appetite; has little to no appetite and/or will be "starving" one minute then full two bites later, then back to hungry again (prone to eating disorders and/or failure to thrive)