

The effectiveness of a brief home-based naturalistic language intervention on the spoken language abilities of children with autism in the Western Cape

By

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ABSTRACT

Background: Naturalistic Developmental Behavioural Interventions (NDBIs) have shown to have a positive effect on cognitive and social outcomes of children with Autism Spectrum Disorder (ASD) though very few NDBIs have been implemented in low- and middle-income countries (LMIC). Challenges in accessing evidence-based interventions for many families of children with ASD living in LMIC exists due to the cost of travel, the remote locations of services, limited availability of services, and/or the financial implications thereof. Providing intervention in the child with ASD's home context may be one way for children to access intervention services needed. Enhanced Milieu Teaching (EMT) has shown to be effective in providing support to language development in children from LMIC. This study expands on previous research and literature by examining the effectiveness of clinician-implemented EMT when administered in the home context of children with ASD in low-resource settings in Cape Town, South Africa.

Objectives: The study's objectives were to determine; i) Does the use of clinician-implemented EMT within the home environment of children with ASD living with their families in the Metropolitan area of Cape Town, Western Cape increase the child's communication abilities, in particular the number of different words a child uses, ii) Do the communication gains made during the intervention generalise to the child's spoken language interactions with their primary caregivers?

Methods: A single case study with multiple baseline design examined the effects of clinician-implemented home-based EMT intervention on the diversity and frequency of spoken language of young children with ASD in South Africa. Intervention sessions occurred in the homes of three young children with ASD between the ages of 45 and 72 months. Each participant presented with minimally verbal language abilities producing 1 word or less per minute at the start of the study, with an age equivalent of 20 months for their expressive language on the PLS-5. The participants received a minimum of 12 bi-weekly intervention sessions within their home context.

Results: A 10-minute segment for each session was transcribed and coded using the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2008) using a prescribed EMT code. Results from the baseline and intervention sessions tracked the number of different words (NDW) used by the participants and was graphed to

determine the effect of introducing the EMT intervention on the dependent variable. A functional relationship was demonstrated between the introduction of EMT and the increases in the NDW used for the three participants. The percentage of non-overlapping data between the baseline and intervention sessions was above 92% for all participants. Evidence of generalisation of their spoken language abilities to interactions with their parents were observed.

Conclusion: A functional relationship between the introduction of the EMT intervention and the increase in the participant's spoken language abilities indicated that EMT may be effective for improving spoken language skills of minimally verbal children with ASD when implemented in the home context by a trained clinician. Providing intervention services within a child with ASD's home context in South Africa is feasible and offers some relief from the logistical and financial strain placed on families of children with ASD in accessing services. The current findings may assist in determining ways to train parents in the implementation of EMT within their home context.

Keywords: autism, Enhanced Milieu Teaching, home-based, low- to middle income countries, minimally verbal, naturalistic developmental behaviour interventions, spoken language abilities.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

This chapter includes an overview of the reasons for conducting the current research study as well as the outline of each chapter, and a list of terminology and common abbreviations used in this dissertation.

1.2 Statement of the Problem

Autism Spectrum Disorder (ASD) is fast becoming a public health concern in South Africa due to challenges faced providing support to children with ASD and their families (Franz et al., 2018). Globally, it is estimated that ASD has a prevalence of 1-2% (Baio et al., 2018) and is described as being one of the most common neurodevelopmental disorders (Franz et al., 2018). However, no population-based prevalence studies on ASD have been conducted in sub-Saharan Africa, although it is believed that the prevalence rate in South Africa would be similar to that experienced globally (Franz, Chambers, von Isenburg, & de Vries, 2017). ASD is defined as a neurodevelopmental disorder with core features of social communicative impairment with restricted, repetitive patterns of behaviour, interests or activities (American Psychiatric Association [APA], 2013). Evidence of communication and language delays in children with ASD is prevalent and signs of social-communication difficulties may be noticeable early in a child's life (Landa, 2007). Though individuals with ASD vary considerably with regard to defining characteristics, it is suggested that approximately 25% - 30% of children with ASD have not yet acquired spoken language by the time they enter preschool (i.e. around 5 years of age) (Tager-Flusberg & Kasari, 2013). As a result of delayed communication and language development, challenges in social and academic contexts may arise (Mitchell et al., 2006; Tager-Flusberg, Paul, & Lord, 2005).

In low- to middle-income countries (LMIC), 39% of children under the age of 5 years are reported to be at risk for not reaching their developmental potential (Black et al., 2017). The ultimate goal for early diagnosis is to ensure that children with ASD have access to evidence-based early intervention to equip them with the best possible opportunities for development and success (Zwaigenbaum et al., 2015). In Africa it is estimated that the general age range of children being diagnosed with ASD is 8 years old through to adolescence (Bakare & Munir, 2011). Late diagnosis of ASD is believed to attribute to delayed language development due to children not having

access to early interventions (Ruparelia et al., 2016). In South Africa, a LMIC, access to early intervention services is limited or costly (Erasmus, Kritzinger, and van der Linde, 2019; Schlebusch, Samuels, & Dada, 2016) and children could wait approximately 24 months for specialised school placement following diagnosis due to the extensive waiting list in the public sector (Malcolm-Smith, Hoogenhout, Ing, Thomas, & de Vries, 2013; Pillay, Duncan, & de Vries, 2020; Springer, van Toorn, Laughton, & Kidd, 2013). During this period following diagnosis and being placed in a specialised school, most children with ASD either attend preschools that are not equipped to provide early ASD intervention or remain at home. Due to limited public healthcare resources, families struggle to access intervention services for their child (van Schalkwyk, Beyer, & de Vries, 2016). Moreover, the South African national unemployment rate of 32.5% (Statistics South Africa, 2020) together with a lack of financial means, contribute tremendously to the burden placed on many families of children with ASD (Schlebusch, Samuels, & Dada, 2016). A correlation between access to support services and increased stress was found in families of children with ASD (Kapp & Brown, 2011). Frustration in families has arisen in South Africa due to disparities in available ASD interventions and the ability to access and implement intervention in a resource-limited contexts (Mthombeni & Nwoye, 2018). Critical efforts therefore need to be made to address the need for effective evidence-based early interventions while considering any contextual adaptations that may need to be made. By introducing early interventions while considering the family of children with ASD's needs and addressing them, we are potentially able to reduce the stress placed on families (Guralnick, 2020).

Early intervention has shown to improve communication and language skills in children with ASD which could contribute to improved outcomes for the child and their family (Landa, 2007). For children with ASD and their families, access to early intervention could lower the cost of care over their lifespan (Black et al., 2017). Investigating ways to assimilate early interventions into existing systems within South Africa therefore needs to occur in order to address the demand for the provision of services to children with ASD (Schlebusch et al., 2020). For young children with ASD, there is increased support towards the use of Naturalistic Developmental Behaviour Interventions (NDBIs) due to considerable international research demonstrating effectiveness (Schreibman et al., 2015; Tiede & Walton, 2019). NDBIs are a class of interventions that incorporate intervention strategies that are child-directed, occur in a natural setting, use a child's natural events (including

play and/or daily routines), and use a variety of behavioural approaches to address a child with ASD's development (Schreibman et al., 2015; Schlebusch et al., 2020). Literature has suggested that NDBIs can be successfully implemented in low-resource settings and used effectively to address communication development in children with ASD who have minimal spoken language use (Kasari, et al., 2014b; Hampton, Harty, Fuller, & Kaiser, 2019). To date, only one study has been published demonstrating use of a NDBI to improve children with ASD's spoken language use in the South African context. Due to the growing need for early ASD intervention and the potential use of NDBIs in a low resource context, further research into the feasibility of implementing such an approach is needed as is determining the effectiveness thereof in South Africa.

Enhanced Milieu Teaching (EMT) is an example of a NDBI in that it is a naturalistic language intervention that uses a child's naturally occurring interactions to promote spoken language development in children with developmental disabilities that effect language development (Hancock, Ledbetter-Cho, Howell, & Lang, 2016). Though most research on the use of EMT has occurred in developed countries (Kaiser & Hampton, 2016; Roberts & Kaiser, 2015), EMT has shown to be effectively implemented to improve spoken language outcomes of children whose families come from low-socioeconomic environments (Hatcher & Page, 2019) and with young children with ASD in the South African context in a school setting (Hampton, Harty, Fuller, & Kaiser, 2019). Considering many families in South Africa have challenges accessing services due to limited available resources, home-based intervention could reduce some of the stress families feel when needing to seek support for their child. Despite limited research, home-based early interventions have proven to elicit positive outcomes for children's development when implemented in contexts with limited resources (Bann et al., 2016; Gona, Newton, Hartley, & Bunning, 2014; Rahman, Iqbal, & Husain, 2009). Growing support towards studies that consider the implementation of ASD interventions in different contexts in South Africa further reinforces the need to disseminate services to children's natural learning environments (i.e., the home-context) (Franz et al., 2018; Guler, de Vries, Seris, Shabalal, & Franz, 2018; Ramseur II et al., 2019; Schlebusch et al., 2020). The primary research aim for this study was therefore to implement a brief home-based naturalistic language intervention to evaluate its effectiveness, feasibility and functional benefits towards improving spoken language abilities of young children with ASD who have minimal language use.

1.3 Chapter Outlines

This dissertation comprises five chapters. *Chapter 1* introduces the study and presents an outline of each chapter. Important terms and abbreviations used in this dissertation are also discussed in this chapter. *Chapter 2* provides a detailed discussion of the theoretical background for this study. This chapter discusses the increasing prevalence of Autism Spectrum Disorder (ASD) and the interrelated occurrence of delayed communication and language development for children diagnosed with ASD, and the consequential effect thereof on other areas of a child's development. The chapter further discusses the growing support for access to early intervention services, especially those under the umbrella of Naturalistic Developmental Behaviour Interventions (NDBIs), to improve young children with ASD's language and communication development. The chapter also highlights the significant strain placed on families in a low- and middle-income country (LMIC) such as South Africa in accessing early intervention services and addresses the research gap with regards to the availability of evidence-based interventions that are contextually relevant in low-resource environments. The applicability of implementing of a NDBI, namely Enhanced Milieu Teaching (EMT), in South Africa will be explored in accordance with implementation research, and focus is on the feasible and functional aspects for use thereof in low resource, naturally occurring settings. The potential benefit of EMT towards improving a child's spoken language abilities and the effect thereof on the dissemination of services to reduce the burden placed on families of children with ASD in South Africa will be discussed. *Chapter 3* of this dissertation outlines the research design, methods and procedures incorporated in this study. Participant description, selection and exclusion criteria, together with recruitment and enrolment for participation in the study will be discussed. Descriptions of the materials, equipment and personnel will be provided. The data collection procedures along with the data analysis process will be described, as well as the ethical considerations incorporated into the study development and execution. *Chapter 4* presents and discusses the study's findings. This chapter further outlines the use of the visual analysis process to evaluate the effect EMT had on the 3 children's number of different words (NDW) used during baseline and intervention sessions. The chapter also discusses the integrity of the results including fidelity data and inter-rater reliability data; EMT effectiveness and to the generalisation of language use to the children's familiar communication partners (parents). Finally, participant results in pre- and post-EMT assessments (using formal and informal language measures) of the 3 children will be compared. *Chapter*

5, the final chapter, offers a critical discussion of the study findings including the EMT intervention effectiveness, feasibility and functional use for children with ASD in the Western Cape of South Africa. The clinical implications, strengths and limitations of the study will be presented, and the recommendations for future research provided.

1.4 Definitions of Key Terms

A list of key term and concepts used in this study are described and tabulated below:

Table 1.1: Definitions of key terms used in this study

<i>Autism Spectrum Disorder</i>	Autism Spectrum Disorder (ASD) is defined as a neurodevelopmental disorder with core features of social communicative impairment with restricted, repetitive patterns of behaviour, interests or activities (American Psychiatric Association [APA], 2013).
<i>Enhanced Milieu Teaching</i>	Enhanced Milieu Teaching (EMT) is a naturalistic model of early communication intervention which makes use of a child's daily routines and interests, and play-based activities (Roberts & Kaiser, 2015).
<i>Early Intervention</i>	Early Intervention refers to procedures that enhance the development of infants and young children who are at risk for developmental disabilities (Guralnick, 2011).
<i>Evidence-Based Interventions</i>	Evidence-based interventions (EBI) are practices or programs that are peer-reviewed and document empirical evidence of effectiveness. EBI uses integrated policies, strategies, activities, and services whose effectiveness

	has been proven or informed by research and evaluation (Shonkoff, 2017).
<i>Feasibility</i>	Feasibility of an intervention refers to whether it is appropriate for further investigation and helps researchers to assess whether or not findings from a study are relevant and sustainable (Bowen et al., 2007).
<i>Fidelity</i>	Examines the degree to which individuals are able to competently implement an intervention as is was designed (Olswang & Prelock, 2015).
<i>Functional Relation</i>	Functional relation refers to the effect of an independent variable on a dependent variable (Wacker, Berg & Harding, 2005).
<i>Generalisation</i>	Generalization refers to the extent to which findings of an evidence-based study can be applied to settings and people outside of the context in which the study occurred (Polit & Beck, 2010). *The use of the term <i>generalisation</i> in this study refers to the transferability of newly acquired skills to familiar, untrained partners (parents).
<i>Implementation Science</i>	Implementation science refers the methods and strategies of evidence-based practices and research used in clinical contexts and investigates how they can be used effectively in naturally occurring contexts (Damschroder et al., 2009).
<i>Low- and Middle-Income Countries</i>	The World Bank income classification is based on national income per person, the first World Development Report introduced groupings of “low income” and “middle income” countries using a

	threshold of \$250 per capita income as a threshold between the groups” (World Bank, 2018).
<i>Low Resource Setting</i>	Low resource settings are typically characterized by a lack of funds to cover health care costs, on an individual or societal level. This includes infrastructure, materials and human resources (Goldstruck, 2014).
<i>Minimally Verbal</i>	Minimally verbal children are defined as those using fewer than 30 functional words and/or who are not able to verbally communicate their needs alone (Brignell et al., 2018). *In this study, the children were classified as minimally verbal if they produced 1 word or less per minute and/or produced a total of 20 different words or less during a 20-minute spontaneous language sample.
<i>Naturalistic Developmental Behavioural Interventions</i>	Naturalistic Developmental Behavioural Interventions (NDBIs) are described to be child-directed, occur in a child’s natural learning contexts and incorporate activities that are socially and contextually relevant, such as in play or daily routines (Tiede & Walton, 2019).
<i>Percentage of Non-Overlapping Data</i>	The percentage of non-overlapping data (PND) is a widely used statistic for the measurement and meta-analysis of single-case experimental designs. To calculate PND, the percentage of data points obtained during the intervention that exceed the extreme values obtained during

	baseline are calculated (Olive & Franco, 2008).
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1.5 Common Abbreviations

Below is a list of the common abbreviations used in this study:

ASD	Autism Spectrum Disorder
ECI	Early Childhood Intervention
EMT	Enhanced Milieu Teaching
LMIC	Low- and Middle-Income Countries
NDBIs	Naturalistic Developmental Behavioural Interventions
NDW	Number of Different Words
PLS-5	Preschool Language Scale 5 th Edition (Zimmerman, Steiner, & Pond, 2011)
PND	Percentage of Non-Overlapping Data
SALT	Systematic Analysis of Language Transcript (SALT) (Miller & Chapman, 2008).
SLT	Speech-Language Therapist
TNW	Total Number of Words
WHO	World Health Organisation

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Delays in communication and language development from an early age are evident in children with ASD (Mitchell et al., 2006) and their early communication skills are indicative of their ability to develop expressive language skills later on in life (Fuller & Kaiser, 2020). The consequential effect of delayed communication and language development is children with ASD often have difficulty in social and academic contexts (Tager-Flusberg, Paul, & Lord, 2005). Early intervention programmes have shown to effectively improve skills for young children with ASD over time (Dawson et al., 2010; Rogers, 1996) with particular improvements shown in spoken language use in minimally verbal children with ASD (Paul, Campbell, Gilbert, & Tsiouri, 2013; Shire, Shih, & Kasari, 2018).

Presently in South Africa, a low- and middle-income country (LMIC), children with ASD and their families often lack access to specialised health and education services, including early intervention (de Vries, 2016). This has consequently resulted in a gap in the provision of early intervention to children at risk for further developmental delays, such as those with ASD. Moreover, it is believed that skilled specialists available to provide interventions to children with ASD living in South Africa will not be able to meet the demands thereof due to the growing number of children being diagnosed with ASD. In order to start closing these gaps in early intervention service delivery, extending research into the provision of interventions through previously established systems is recommended, as well as disseminating these services to possibly include other role players (Schlebusch et al., 2020).

Naturalistic Developmental Behavioural Interventions (NDBIs) are a group of interventions that have proven to have a positive effect on communication and social outcomes for children with ASD (Kasari et al., 2008; Ingersoll & Schreibman, 2006). Enhanced Milieu Teaching (EMT) is an evidence-based naturalistic language intervention that encompasses a child's naturally occurring interactions to promote spoken language development in children with developmental disabilities that effect language development (Hancock et al., 2016). Studies have shown that EMT can be an effective intervention to support language development in young children from low-income homes (Hancock, Kaiser, & Delaney, 2002) and young children with ASD (Hancock & Kaiser, 2002; Kasari et al., 2014). A recent study conducted in South

Africa investigated whether clinician-implemented EMT was an effective intervention approach to improve children with ASD's spoken language abilities (Hampton et al., 2019). EMT was implemented with 3 young children with an ASD diagnosis in a clinical setting within a school in South Africa. Results from the study demonstrated a positive effect on the children's spontaneous communication, showing that EMT may be an effective intervention to use with minimally verbal children within LMIC. Despite displaying positive outcomes on children's spoken language abilities, the study was limited to intervention within a school context, and the reality of the current situation in South Africa is that many children with ASD are still awaiting school placement (Pillay, Duncan, & de Vries, 2017) and therefore do not easily have access to resources that may be available within contexts such as schools.

The current study arose from my experience as a Speech-Language Therapist working in a LMIC, and in particular, in schools and the home contexts of families with children diagnosed with ASD in Cape Town, South Africa. First-hand experiences I have witnessed as a professional treating children with ASD and their families in the public sector in South Africa, are the developmental challenges young children with ASD and the emotional stress their families face in this context. These are testament to how essential additional research into effective evidence-based early interventions is for children with ASD. Erasmus, Kritzinger, & van der Linde (2019) found that families receiving an ASD diagnosis are significantly impacted by the need to financially provide for their children in order to access ASD specific services. Additionally, access to evidence-based services for children with ASD often require that families have to travel in order to receive services in remote locations. Implementing intervention in the home environment may therefore be a possible solution to providing services to children with ASD who would otherwise have difficulty accessing the limited existing services. This study examines the effectiveness of clinician-implemented EMT administered in the home context of children with ASD in low-resource settings in Cape Town, South Africa.

2.2 Autism Spectrum Disorder

ASD is defined as a neurodevelopmental disorder with core features of social communicative impairment with restricted, repetitive patterns of behaviour, interests or activities (American Psychiatric Association [APA], 2013). These core features are generally observed in early childhood with at least a third of children with ASD reporting regression in their language and social skills (NICE, 2013). ASD

is a lifelong disorder that affects each person and their families differently (NICE, 2011). Furthermore, ASD can co-occur with other conditions that are often unrecognised. The World Health Organisation (2013) reported that an estimate of one in every 160 persons are diagnosed with Autism Spectrum Disorder (ASD) and that most people with ASD are living in low- and middle-income countries (LMIC), such as those found in Africa where environmental factors may play a role including poor nutrition and challenges to accessing adequate healthcare, though the prevalence is yet unknown and limited research has been conducted.

In South Africa, many challenges are faced when having to provide a comprehensive assessment and diagnosis of an individual with ASD due to the complexity of the process (Malcolm-Smith et al., 2013) and this results in children with ASD being diagnosed much later than those in high resourced settings (Ruparelia et al., 2016). Moreover, suitable management of children with ASD is hindered by difficulties accessing interventions that are specific for ASD as well as evidence-based. Studies within Africa have shown that of the children being diagnosed with ASD, many were presenting with little to no spoken language (Bakare & Munir, 2011). This resultant factor was thought to be linked to lack of early interventions including those of education and behaviour and insufficient services available in health care facilities, as well as a lack of awareness about ASD in Africa. It is believed that at least 10 children are diagnosed with ASD via state funded facilities in the Western Cape, South Africa every week (Bateman, 2013). Further studies on ASD in LMIC are therefore imperative to improve awareness of disorder and provision of intervention (Abubakar, Ssewanyana, de Vries, & Newton, 2016; Bakare & Munir, 2011; de Vries, 2016; Elsabbagh et al., 2012; Ruparelia et al., 2016) as well as addressing means to improve access to effective interventions that target early speech and language development (Bakare & Munir, 2011). The global increase in the prevalence of ASD means that more specialised support services are needed to address the varying degrees of impairment that hamper people with ASD's daily functioning, especially in Africa.

2.3 Communication and Language Skills in Autism Spectrum Disorder

The most notably associated delayed developmental features of ASD is that of impairments in a child's verbal (spoken language) and nonverbal communication (gestures, eye contact) (American Psychiatric Association [APA], 2013). The impacting effect of communication and language delays is possible academic and

social difficulties (Kaiser & Roberts, 2011; WHO, 2013), difficulty establishing and maintaining friendships (Bauminger & Kasari, 2000) and challenges with behaviour (Koegel, Koegel, & Surratt, 1992). In individuals with ASD, early language deficits were shown to be predictive of communication abilities in adulthood (Gillespie-Lynch et al., 2012). A meta-analysis research study conducted by Curtis, Frey, Watson, Hampton & Roberts, (2018) looked at the impact language delays have on problem behaviours in children across 47 studies. The results showed that children with language disorders have increased problem behaviours compared to their typically developing peers. Children with ASD who developed early childhood language skills were predicted to have improved social abilities, be more independent and show better outcomes later on in life (Gillespie-Lynch et al., 2012; Magiati, Tay & Howlin, 2014).

Due to difficulties with social communication and language skills and the resounding effect that has on other areas of development for children with ASD, a fair amount of research has been conducted in high-income countries to identify evidence-based communication and language interventions (Brignell et al., 2018; Goldstein, 2002; Hampton & Kaiser, 2016; Kasari et al., 2014b; Paul et al., 2013). Despite the growing number of research studies into early predictors of language development and interventions for children with ASD, limited knowledge of the minimally verbal child with ASD who have challenges acquiring language is available (Tager-Flusberg & Kasari, 2013). Literature suggests that a varied description of minimally verbal child with ASD exists which is often dependent on the instruments used to define the verbal abilities (Bal, Katz, Bishop, & Krasileva, 2016) though Brignell and colleagues (2018) defined minimally verbal as children using fewer than 30 functional words and/or who are not able to verbally communicate their needs alone. The spoken words and phrases a minimally verbal child might use is often characterised as being scripted, stereotyped and/or repetitive and therefore not used appropriately for social communicative purposes (Kasari, Brady, Lord, & Tager-Flusberg, 2013). Developing spoken language and the ability to communicate one's needs, form and establish relationships as well as participate academically is a fundamental right for children. Challenges arising from children with ASD's communication and language difficulties can impact on a family's quality of life and create family stress. It is suggested that 25% to 30% of children with ASD would not have developed sufficient spoken language, and therefore be defined as minimally verbal, by the time they are preschool aged (Tager-Flusberg & Kasari, 2013). Further

research into the child with ASD who has minimal language development and understanding approaches to remediate the compounding effects thereof is required.

2.4 Early Communication and Language Intervention for Children with ASD Living in South Africa

Early intervention services are imperative as for many families of children with ASD, this is their initial contact with professionals from who they seek remediation for an array of their child's needs (WHO, 2013). Ruparelia et al. (2016) discussed that some of the challenges faced in Africa include the lack of available resources and limited clinicians who are trained to provide evidence-based interventions for children with ASD. Intervention services for children with ASD in South Africa that are state funded are few and therefore not readily available. Consequently, families cannot easily access intervention for their child after receiving a diagnosis of ASD and additionally, the availability of special schools is limited in South Africa (Bateman, 2013; Malcolm-Smith et al., 2013; Mitchell & Holdt, 2014). Though no official statistical information is available in South Africa, most children diagnosed with ASD are enrolled for placement at autism-specific, public schools (Pillay, Duncan, & de Vries, 2017). Following a diagnosis of ASD, children are then placed on a waiting list for special school placement which can often take up to 24 months. Recent figures in the Western Cape of South Africa indicate that the majority of children with ASD attend public, government-funded schools (81%) with a minority (19%) attending private-funded schooling (Pillay, Duncan, & de Vries, 2020). Of those children with ASD attending school, only a small portion were under the age of 5 years old as most public schools in South Africa do not offer school placement for children under the age of 6-7 years old. Families face great challenges accessing early intervention services through the public health sector (van Schalkwyk et al., 2016) and services available in the private sector are costly. The majority of South African families do not have the financial means to afford private intervention services, alternatively it causes great financial pressure on those who do make use of them (Mitchell & Holdt, 2014). According to de Vries (2016), it can be deemed unethical for a child to receive a diagnosis of ASD without providing them with the necessary intervention. For a child with ASD, not being able to access early intervention services can have a tremendous impact on the child's development as well as the family's quality of life (Mitchell & Holdt, 2014). The greater impact of those with ASD not receiving intervention, is that of poor academic achievement, challenges attaining employment, and as a result, negative economic repercussions for a country (Munir

et al., 2016). Further emphasis needs to be placed on evidence-based research of various intervention approaches for individuals with ASD and their families in South Africa. We are therefore now seeing a growth of interest in ASD education and research especially in the clinical and academic fields (Malcolm-Smith et al., 2013).

A research review by Goldstein (2002) focused on 60 peer-reviewed articles over the past 20 years that evaluated the treatment effectiveness of communication interventions applied to children with ASD. He found that there is significant evidence demonstrating the effectiveness of interventions to improve children with ASD's communication skills and that these interventions can have significant impact on long-term outcomes, such as academic achievement. Numerous research studies have further emphasized the importance of early intervention to communication and social development for children with ASD (Zwaigenbaum et al., 2015). Children who receive intervention targeting early social communication skills have shown substantial improvements in their social communicative skills (Fuller & Kaiser, 2020) and greater long-term language improvements (Kasari, Gulsrud, Wong, Kwon, & Locke, 2010). In a meta-analysis study by Fuller & Kaiser (2020), 29 early intervention programs that specifically targeted social communication skills for children with ASD were examined. The study aimed to determine whether the effect of the interventions examined were influenced by the age at which the children received the treatment, the treatment dosage, the person implementing the intervention and the context in which the intervention outcome measures were recorded. Results concluded that early intervention has a meaningful effect on a child's social communication skills, however the total amount and duration of the implemented intervention had limited impact on social communication gains made. This could potentially show that it is not necessary the quantity of the intervention that has the most significant impact on the gains made in a child's communication but the quality of the intervention.

In South Africa, it was found that the financial implications for providing support services to children with ASD is costly and frequently places significant strain on families (Erasmus et al., 2019). It is essential that professionals providing services to children with ASD have a clear understanding of how the contextual factors of each family may have an impact on the child's overall developmental outcomes. Additionally, the skills taught during interventions are often not generalised to different contexts and people outside of the intervention setting due to the structured

nature of the context in which these skills are introduced in. It is therefore important that interventions make considerations for generalisation as children with ASD have difficulty generalising learnt skills to untrained contexts (Kasari et al., 2010). Expanding on research to include interventions targeting social communication difficulties that are characteristic to ASD is imperative in South Africa, especially those investigating the effective use within the South African context. However, research needs to be representative of and considerate towards the environmental contexts of families of children with ASD living in South Africa as well as the generalisation effects of communication outcomes to other communication partners.

2.5 Naturalist Developmental Behavioural Interventions (NDBIs)

NDBIs have started emerging over the past 20 years following the need to apply developmental and behaviour intervention practices for children with ASD within a strong research base (Schreibman et al., 2015). NDBI's are described to be child-directed, occur in a child's natural learning contexts and incorporate activities that are socially and contextually relevant, such as in play or daily routines (Tiede & Walton, 2019). Strategies used with NDBIs further promote spontaneous interactions and generalisation of targeted skills due to the natural connections made between the skill being developmented and the consequence thereof. These are then reinforced even further by involving the children's caregivers in the interventions. A defining factor of NDBIs is that they all have several features that are consistent in their interventions, including but not limited to the utilisation of a three part contingency (antecedent-response-consequence) to provide the child with a clear understanding as to when and how to respond, the provision of specific intervention procedures to follow, treatment that is individualised to address each child's development, and environmental arrangement that allows for engagement between the child and adult (Schreibman et al., 2015). A meta-analysis of 27 studies which made use of NDBI strategies found that even though the resultant effect of the intervention on children's expressive language was slight, it was still significant when considering that interventions were generally implemented over a limited time period (a total of less than 50 hours of intervention) (Tiede & Walton, 2019). When considering that communication is a main deficit for children with ASD, the study found that even small effects exhibited in a child's communication skills are relevant. Modest gains reported in NDBI studies could be related to the heterogeneity of the participants and variations in program characteristics which may impact on the

results, as well as the variety of assessment tools used to measure social-communication and language skills.

Recent studies using NDBIs with minimally verbal children with ASD have demonstrated positive outcomes in increasing their spoken language (Pizzano, 2020) though it needs to be emphasised that children responded differently to various approaches. Much focus has been placed on studies targeting potential improved language development in children with ASD, though one cannot ignore the importance of social-communication skills due to the inherent challenges that are faced by individuals with ASD. Using NDBI approaches to address language skills as well as social engagement in children with ASD, has proven to be effective in increasing a child's spoken language ability, as well as their length and frequency of reciprocal communication exchanges (DiStefano, Shih, Kaiser, Landa, & Kasari, 2016).

It is suggested that NDBIs are likely to yield sustained outcomes and therefore prove to be effective for use within different communities when implemented over a longer duration. Using a natural teaching context to target language development has also shown to have positive outcomes for children with ASD who display disruptive behaviours in reducing such tendencies (Koegel, Koegel, & Surratt, 1992). It is thought that the naturalistic and motivational nature of NDBIs assisted in decreasing the occurrence of disruptive behaviours and reinforced the use of positive responses. In low-resource settings, literature has suggested that the use of naturalistic interventions can be implemented (Kasari et al., 2014a; Kasari et al., 2014b) and currently only one intervention study has been implemented in Africa using NDBI approaches to address communication development in children with minimal spoken language use (Hampton et al., 2019). The need for further investigation into the effective use of NDBIs within LMIC contexts to address communication in children with ASD exists as NDBIs could prove to be effective for use with children with ASD in such contexts due to the versatility and flexibility of the approach.

2.6 Enhanced Milieu Teaching (EMT)

Enhanced Milieu Teaching (EMT) is an example of a NDBI, as it is a naturalistic language intervention aimed to improve children's communication skills. EMT makes use of a child's daily routines and interests to introduce language through strategies

such as modelling and prompting in everyday communication contexts (Kaiser & Hampton, 2016; Roberts & Kaiser, 2015). Areas of focus within EMT include environmental arrangement to promote engagement, language responsiveness, modelling targeted language, expanding communication attempts and milieu teaching prompting procedures (Kaiser & Hampton, 2016; Hancock et al., 2016). Milieu teaching has shown to be used successfully to expand on children with ASD's language skills (as well as children with other conditions) as this type of intervention includes a variety of communication functions such as preverbal communication, social amenities, positive interactions with peers, question answering and increased spontaneous verbalisations (Goldstein, 2002; Hampton & Kaiser, 2016).

Enhanced Milieu Teaching (EMT) conducted with children with language impairment showed increases in their number of total words used (Roberts & Kaiser, 2012), while children with language delays displayed a reduction in problem behaviours 12 months post-intervention (Curtis, Kaiser, Estabrook, & Roberts, 2019), and children with ASD showed improvement in targeted communication skills as well as receptive and expressive language skills (Roberts, Kaiser, Wolfe, Bryant, & Spidalieri, 2014) and in their social communication skills (Dunn Davidson, Qi, & Kaiser, 2020; Kaiser, Hancock, & Nietfelt, 2000). EMT has further shown to render improvements in receptive and expressive language skills in toddlers that are at risk for language delay with limited cost and duration of time involved when implementing the intervention (Roberts & Kaiser, 2015) as well as to improve the language abilities of minimally verbal children with ASD (Hampton et al., 2019; Kaiser et al., 2000, Kaiser & Roberts, 2013). A potential reason for the positive effect of EMT as a language intervention could be due to the combined use of natural behavioural interventions and responsive models that promote appropriate language development (Ingersoll, 2010).

Studies have shown that children with ASD who received EMT trainer-implemented intervention demonstrated increased targeted language skills which were maintained over time, with some generalisation of these skills to their parents (Hancock & Kaiser, 2002; Kaiser & Hester, 1994). In a systematic review and meta-analysis study conducted by Hampton & Kaiser (2016), 26 early intervention studies documenting the effects of spoken-language outcomes for children with ASD were reviewed. Results of the study indicated that early intervention improves spoken-language outcomes of children with ASD and that the greatest effect occurred when

the implementation intervention involved both the parent and clinician, in comparison to only clinician implemented intervention (Hampton & Kaiser, 2016). It is understood that due to the nature of milieu teaching procedures there is less of a need to plan for generalisation of targeted skills (Goldstein, 2002) and due to the implementation of EMT within a child's naturally occurring routines and interests, this too in turn helps children with ASD to use skills acquired with other communication partners and to maintain these skills (Kaiser & Hester, 1994; Hampton et al., 2019).

An initial study into the feasibility and effective use of EMT as an intervention for children with ASD within South Africa showed that when EMT strategies were implemented in a familiar context (school) by a trained clinician an increase in variability and spoken use of language was evident (Hampton et al., 2019). Because EMT occurs within a child's natural communication environments, in a low resource context such as in South Africa, there is need to better understand how EMT can be used and adapted to suit different linguistic and cultural contexts. In the USA, bilingual caregivers have successfully been trained to implement EMT in the home context (Peredo, Zelaya, & Kaiser, 2018). However, limited research exist which documents the adaptations which would be needed to implement EMT successfully in a LMIC context. In South Africa, there is a lack of trained clinicians to provide intervention for the number of individuals with ASD and a shift is being made towards training parents/carers to deliver these interventions (de Vries, 2016).

2.7 Adapting Interventions for the South African Context

South Africa is a developing country and is classified as a LMIC (World Bank, 2018), as well as 'resource-limited'. For most children with ASD living in South Africa, a lack of access to effective early identification and intervention services along with limited support for families, presents a great challenge to their optimal development (Schlebusch et al., 2020). Research has shown that many families caring for children with ASD in South Africa have to themselves finance the cost of professional services for their child (Erasmus et al., 2019; Schlebusch, Samuels, & Dada, 2016). However, a number of families in South Africa will not readily be able to access intervention services because of insufficient funds to be able to pay for intervention services or due to the need to travel far to access these services (Zwaigenbaum et al., 2015). Additionally, due to varying cultural beliefs, as well as a lack of understanding around the identification and/or diagnosis of ASD, some

parents are less likely to access evidence-based intervention services for their children (Grinker et al., 2012). This is further affected by family traits and cultural factors which means it is important that these are also taken into account when working with children with ASD and their families. In South Africa little is known about how cultural differences might affect treatment approaches and how to improve the validity thereof (Grinker et al., 2012; Mthombeni & Nwoye, 2018). For many families of children with ASD in South Africa, the parents' or caregivers' understanding and decisions made towards accessing interventions for their children is linked to their knowledge and awareness of ASD, their views and beliefs around treatment systems and access to available intervention services (Mthombeni & Nwoye, 2018). Critical efforts need to be made in LMICs to rectify the gap in effective, evidence-based, lower-cost treatments for people with ASD through sharing of best practices and research (Elsabbagh et al., 2012; WHO, 2013). Additionally, access to intervention and education services that is cost-effective is a fundamental right for people with ASD (Abubakar et al., 2016; Mitchell & Holdt, 2014; NICE, 2013; WHO, 2013).

In order to provide services to these vulnerable populations, clinicians and researchers need to look to ways in which interventions can be provided to promote sustainability and with reduced available resources and manpower from initial implementation (Schlebusch et al., 2020). In the South African context, it is evident that the availability of skilled clinicians to meet the need to provide early intervention services to children with ASD may never be enough, and therefore exploration into a range of interventions needs to be explored (de Vries, 2016). In a scoping review conducted by Franz and colleagues (2017), of the 11 ASD studies that were conducted in Africa, not one study investigated early intervention in children with ASD. To date, only 1 study has been published on the use of a NDBI on the spoken language outcomes of children in South Africa (Hampton et al., 2019). Families of children with ASD rely heavily on clinicians to provide them with practical strategies to best support their child, as well as to address their own emotional and physical wellbeing (Fewster & Gurayah, 2015). In South Africa, despite increased involvement of parents and caregivers in early intervention for their child with ASD, interventions rarely consider and address the family's needs (Fewster, Uys, & Govender, 2020). By providing increased support directed at both the child with ASD and their parents or caregivers, early interventions are better able to support the child's long term development by reducing possible family stressors (Fewster & Gurayah, 2015;

Fewster et al., 2020; Gularnick, 2020). Trained clinician's therefore must stay abreast with evidence-based ASD literature and ensure they incorporate contextual sensitivity and considerations towards family needs when working with children with ASD and their families to provide best practices (Roberts & Kaiser, 2015; Ruparel et al., 2016).

2.8 Effective Implementation of EMT in the South African Context

Implementation science relies on the relationships between people and communication (Shaw et.al., 2014). This field further emphasizes the importance of using interventions with previously demonstrated research effectiveness in different delivery systems and/or with different populations as it reduces the costs involved, is more sustainable over a period of time, and can usually then be generalised for use in other settings (Aarons, Sklar, Mustanski, Benbow, & Brown, 2017; Damschroder et al., 2009). It is therefore important that an understanding of the interactions, relationships and sociocultural contexts of intervention approaches, be better understood in terms of what makes them effective. According to Aarons et al. (2017) if an evidence-based intervention (EBI) is introduced to fidelity in a context that is similar to that in which it was proven to be effective before, it can be predicted that it will demonstrate similar beneficial outcomes when applied to different populations with the same delivery system. To ensure the integrity of the intervention, the core components thereof must remain the same and any modifications made to components of the intervention be fitting to the context but not interfere with the mechanisms which ensure the interventions effectiveness.

The Consolidated Framework for Implementation Research (CFIR) was described by Damschroder et al. (2009), which highlighted the importance of adapting interventions to various settings to ensure they have more reliable effectiveness. This is particularly important for research of EBI use for children with ASD in LMIC, such as South Africa, where access to cost-effective, well-researched interventions are lacking. Also looking into existing systems can prove to be a helpful and time reducing step in addressing ways to modify existing early interventions to be more contextually relevant and identify potential individuals to train and therefore implement services (Schlebusch et al., 2020). Thus implementation science looks to improve the fit of established interventions in novel contexts but at the same time ensuring that the intervention remains effective.

When clinicians implement interventions in contexts that the intervention had not originally been designed for, they need to be aware of cultural and individual norms of the participants receiving the interventions, as well as their families and broader community characteristics as this could impact on the implementation effectiveness of the intervention (Damschroder et al., 2009; Zwaigenbaum et al. 2015). In a study conducted in the South African context by Guler et al., (2018), caregivers of children with ASD participated in focus groups to gather qualitative information regarding the adaptation of a caregiver-facilitated early ASD intervention used in a resource restricted setting. The results indicated that caregivers showed a preference towards a cost-effective, home-based, individualised, early ASD intervention. The caregivers reported that when their child with ASD received intervention in a clinic-based setting that the skills learned there were not being used in the home-based setting. Furthermore, with South Africa being a multicultural context, caregivers expressed the importance of sensitivity and understanding of their practices and beliefs when interventions are being implemented with their child with ASD. A study by Ramseur et al., (2019) found that many caregivers of children with ASD in South Africa make use of routine activities together with their child to teach new skills and well as to socially engage. In order to adapt interventions for a low resource setting such as South Africa, better understanding of daily family routines is necessary.

The current study aimed to determine whether EMT, an existing evidence-based intervention (EBI) that has proven to be effective when used in high-income countries to improve children's spoken language, can be used in a LMIC such as South Africa. Literature has shown that EMT is an effective treatment approach that not only improves children's language and rate of communication but can positively impact other developmental domains (Kasari et al., 2014b; Hancock & Kaiser, 2002). This is particularly beneficial for families as it reduces the cost and time involved accessing various interventions (Curtis et al., 2019). Moreover, this study expands on previous EMT research that was conducted in South Africa to transition the implementation thereof from a therapeutic clinic context to that of the child with ASD's home context (Hampton et al., 2019). The idea of implementing EMT in a child's home context stemmed from studies supporting the need to investigate the implementation contexts of ASD interventions in South Africa (Franz et al., 2018; Guler et al., 2018; Ramseur II et al., 2019). Home-based early interventions targeting various developmental areas has proven to demonstrate positive outcomes when implemented in limited resource settings, though the research is limited (Bann et al.,

2016; Gona et al., 2014; Rahman et al., 2009). Providing intervention services within the home is also hypothesised to reduce the family's burden of having to travel to access intervention services for their child as well as promote increased social responsiveness from the child with ASD due to the naturalistic context where the intervention is implemented.

Studies too have highlighted the importance of using measures to determine generalisation of the intervention to untrained persons (Fuller & Kaiser, 2020). Parents of children with ASD in South Africa frequently report challenges for their child to generalise skills targeted during interventions implemented in clinical settings to that of the home setting (Guler et al., 2018). Investigating whether potential gains made from the clinician-implemented EMT within the home environment of LMIC families in South Africa generalise to the child's use of spoken language in interactions with familiar, untrained communication partners, such as parents would be a first step in addressing these recommendations.

2.9 Family Stressors

In order to integrate an intervention into a novel contextual setting an understanding of not just the environmental contextual factors (such as available resources and previously established healthcare systems to provide support to children with ASD and the families) but also the personal internal systems of these families, such as family stress is recommended. Damschroder et al. (2009) describes this as considerations in both the "outer" and "inner" settings paradigms when implementing interventions to efficacy in other settings. Parents of children diagnosed with ASD have reported to experience high levels of stress which often relate to the parent child relationship as opposed to the ASD diagnosis itself. Families even with relatively high levels of social support expressed feelings of anxiety which could be related to their child's unpredictable behaviour and society's perceptions thereof (Plumb, 2011; Schlebusch et al., 2016). This too impacts on the family's engagement in routine activities and the inclusion of a child with ASD therein. In South Africa, stress in families of children with ASD was found to be related to their access to support services for both the caregivers and their children (Kapp & Brown, 2011). Accessibility to social, emotional and therapeutic supports were essential in the family's ability to cope with the demands placed on them. Families from limited resource settings experience numerous challenges which impact on their ability and readiness to seek out and sustain interventions for their child (Rickards, Walstab,

Wright-Rossi, Simpson, & Reddihough, 2007). An additional factor that places strain on families living in a LMIC such as South Africa is that of having to fund the cost of accessing professional services required due to the lack of available public resources that are specific for children with ASD (Greeff & van der Walt, 2010; Schlebusch et al., 2016).

A direct relationship between regular family routines and better satisfaction in their quality of life was reported by families of children with ASD in South Africa as well as when families had a higher consideration of their parental responsibilities (Greeff & van der Walt, 2010; Schlebusch et al., 2016). It is therefore essential to examine how an intervention to support a child ASD can be incorporated into existing family routines considering their available resources and capabilities, in order to alleviate some of the existing stress placed on these families in LMICs. A plausible way to achieve this would be to investigate how an existing intervention, such as EMT, could be implemented within naturalistic family contexts such as that of the home environment.

Implementation of EBI in a home-based environment on children with ASD have shown to promote improvements in various areas of their development due to the naturalistic nature of the environment and the degree to which generalisation can occur. Home-based interventions have further shown to be more cost effective and potentially more sustainable compared to clinic-based contexts (Rickards et al., 2007). Home-based intervention programs targeting communication development in children with ASD demonstrated an effect on children's communication skills. Despite these improvements, parents continued to note specific ASD characteristic which they related to attributing to family stressors, particularly behaviours displayed (Küçüker, 2006; McConkey, Crawford, McGreevy, Reavey, & Cassidy, 2010). This continues to emphasise the necessity to take family support needs into consideration when implementing early intervention approaches. In a one-year follow-up study, Rickards et al. (2007) found that children with ASD who received home-based intervention were able to sustain the improvements that they made following the intervention measured after a year. The study highlighted the importance of identifying families who are not readily able to access social support and those who experience considerable family stress as candidates for additional home-based intervention. Kasari et al. (2014b) compared brief home-based interventions to group-based interventions of children with ASD who had limited

resources. Both groups made improvements across areas of joint attention and joint engagement though results were more prominent in the home-based intervention group with lower rates of attrition. Children living in LMIC who come from families with limited resources have shown to benefit comparatively from home-based early intervention when compared to those from families with high resources (Bann et al., 2016). In South Africa, there is a need to decentralise intervention services and make it more accessible to a larger population of children with ASD and their families and this is particularly important for families with limited resources (de Vries, 2016). Incorporating evidence-based early interventions that not only acknowledge the child with ASD's needs but also that of their parents can provide much needed support towards the holistic development of the child by reducing family stress (Fewster et al., 2020). Moreover, involving and eventually training parents in methods to address areas of their child's development within home-based settings and in their established routines could potentially demonstrate effective results, as well as alleviate some of the family's challenges and stressors in accessing services (Franz et al., 2018).

The focus of the current study was to extend the current research on Enhanced Milieu Teaching (EMT) in South Africa. The primary research question that guided this study was: Can EMT, a brief home-based intervention, be used within the home environment of families living in the Western Cape to improve a child with Autism Spectrum Disorder's spoken language abilities? The research question was broken down into 2 sub-questions namely: (1) When EMT is implemented within the home environment of families living in the Western Cape does it increase i) the total number of words and ii) the total number of different words that the child uses appropriately in social interactions? (2) Can the child maintain the words they have learnt with the EMT clinician and use them when they interact with their primary caregivers?

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter describes the research design and sampling method used in the study and provides a rationale for the use of the chosen design and sampling methods. The research question, together with the aims and the objectives of this research study, are set out below. Participant descriptions, selection and exclusion criteria, together with recruitment and enrolment for participation in the study is discussed. This will be followed by a description of the materials, equipment and personnel used, and the validity and reliability measures implemented in the study. The data collection procedures along with the data analysis process will be described. The chapter will conclude by defining the ethical protocol followed to ensure the research study complied with the ethical principles outlined in the Declaration of Helsinki.

3.2 Research Question and Objectives

The main research question for this study was as follows:

Does clinician-implemented Enhanced Milieu Teaching (EMT) used within the home environment of families living within the Western Cape increase a child with Autism Spectrum Disorder's (ASD) communication abilities?

To address the research question, the primary aim of the study was to determine whether a brief naturalistic language intervention, such as EMT, could be effectively implemented within the home context of children with ASD living in a low- to middle-income country (LMIC) such as South Africa.

In order to address the research question and aim of this study, the following objectives were established:

- To determine if the use of clinician-implemented EMT within the home environment of families living in the Western Cape increases the total number of different words a child uses
- To determine whether the language gains made by the children during the intervention maintained to the child's spoken language interactions with their primary caregivers (parents).

3.3 Participant Information

3.3.1 Participant Selection and Description

Three young children with Autism Spectrum Disorder (ASD) who were minimally verbal were recruited to participate in the current study. The children were classified as minimally verbal in that they produced 1 word or less per minute and/or produced a total of 20 different words or less during a 20-minute spontaneous language sample which was conducted at the pre-intervention assessment. The following inclusion criteria were used to identify participants for the study. Participants had to:

- be between the ages of 42 to 84 months
- use English as their primary spoken language
- have a primary diagnosis of ASD
- attend an Early Childhood Development (ECD) or Junior Phase class at the target school for learners with ASD or be on the waiting list for school placement
- have a minimum of 1 and a maximum of 20 different spoken words (confirmed during the assessments and corroborated by the parents)

Exclusion criteria included children with additional hearing/visual difficulties as well as children with multiple disabilities.

3.3.2 Participant Recruitment and Enrolment

Three young children (45 – 74 months) with ASD that met the inclusion criteria were included in the current study. The following procedures were followed for participant recruitment and enrolment:

1. A school for children with ASD in Cape Town, Western Cape was approached to identify children on the school's waiting list who had been observed for future placement as well as children within the school's preschool classrooms who meet the inclusion criteria.
2. Following the identification of potential participants by the school principal, school psychologist and the researcher, the participant's parents were contacted telephonically and asked whether they would consider including their child in the study.
3. A parental consent form was then emailed to the parents of the potential participant. Within the parental consent form, parents were made aware that they could withdraw their child from the study at any point and that this

would not negatively affect their child in any way or influence the services the child was receiving (Appendix A).

4. The parents also consented to their child being video recorded for the duration of the study and themselves being video recorded for the purpose of the pre- and post-intervention assessment sessions (Appendix B).
5. Determining children's language levels during 2 pre-intervention assessment sessions using informal and formal language assessments.

All of the three children enrolled in the study were male and lived with either one or two of their biological parent(s) in the Metropolitan area of Cape Town. Of the three children that were enrolled in the study, two had attended observation assessments at the target school for children with ASD and were awaiting school placement. Of the two awaiting school placement, Participant 1 ("Madison") was attending a mainstream day-care centre, while Participant 2 ("Tariq") was at home, but neither of them were receiving Speech-Language Therapy at the time. The other participant, Participant 3 ("Andy"), was attending a preschool class at the targeted school and was receiving once weekly, group Speech-Language Therapy within his classroom. Table 1 provides information of the three children enrolled as participants in the study:

Table 3.1: Participant information for all three children

	Participant 1	Participant 2	Participant 3
Pseudonym name	"Madison"	"Tariq"	"Andy"
Gender	Male	Male	Male
Age (in months)	45	74	69
Language Exposure	English	English	English
Words per minute (pre-intervention)	0.70	1.45	0.05
Number of different words	14	18	1

3.3.3 Research Settings

Pre- and post-intervention sessions were conducted in a therapy room within a clinical setting with all three children. The children did not receive any other instruction in this room before or during the study. The room contained a child-sized

table and chairs, fixed cupboards, 2 adult-sized chairs, a carpet covering the floors, a camera mounted on a tripod and a kitchen timer. Formal assessment measures and informal protocols were used to gather data on the children's language levels. The sessions were conducted once a week for two weeks and lasted between 20 to 40 minutes. When necessary, the child's parents were present in the therapy room and/or instructed to engage with their child.

Baseline and intervention sessions took place in the children's home and consisted of 2-3 sessions per week, depending on the child and their family's availability, and lasted 20 minutes over a 4-month period. During all sessions with the children, the clinician was seated on the floor, in front of the child.

Sessions for Madison (Participant 1) were conducted initially at his grandmother's home, where he spent his time after school, with his grandmother, mother and father present in the sessions. He and the clinician sat on a mat on the floor of the living room. The living room consisted of two couches, and a table with a TV and DVD player on. Madison and his family moved during the intervention period, and subsequent to the move, sessions were conducted within his new home and took place either in his playroom on a mat on the floor or in the living room on a carpet in the centre of the room. He was frequently distracted in the playroom in that he often stared out the window, so sessions were moved to the living room and a mat was placed on the floor between couches with his mother and father in attendance.

Sessions for Tariq (Participant 2) took place initially at his home in the living room while sitting on the floor with a mat placed down where he lived with his mother and sister. His parents were separated and his father lived elsewhere. The large living room table was moved to make space and two couches were behind the table on either side thereof. Tariq's toys and bicycles were kept in the room which often became a distraction and had to be removed to minimise additional distractions. His mother and sister remained in a separate room to deter his sister from attempting to engage in the sessions. This was at times distracting as she would cry, and he was quite sensitive to the noises in his environment. Consequently, as the sessions progressed, his mother and sister would go to the house next door to reduce any distractions. Tariq's family moved during the baseline sessions to his maternal grandmother's home and sessions took place in a small available area on the living room floor between the dining room table and couch. The room was free of

distractions and his sister was either not present in the home or was upstairs with his mother during sessions.

Sessions for Andy (Participant 3) took place at his home in his living room on a mat on the floor. Two couches and a table with a TV was in the room but the living room opened up to the rest of the house. Andy was therefore often distracted by happenings in the home and adjustments had to be made to ensure he was less distracted as well as providing him with a visual schedule to support his transitions to the sessions.

3.4 Positionality of the Researcher

The researcher in this study is a qualified Speech-Language Therapist, with 12 years experience working with young children with Autism Spectrum Disorder (ASD) and their families in both public and private education and healthcare sectors in South Africa. Having worked within multidisciplinary teams she had used comprehensive, collaborative approaches to assessment and had devised intervention services for children with a range of developmental difficulties, including implementation of parent support and training within homes of children with limited access to resources due to financial and/or social contextual constraints. She previously assisted in the recruitment and enrolment of participants for an EMT study that took place at a school for children with ASD in the Western Cape where she worked as the Speech-Language Therapist. Her interest in the use and effective implementation of EMT was sparked due to her exposure to the use of the Naturalistic Developmental Behaviour Intervention (NDBI) approach to address young children with ASD's language development within a clinical context, such as a school. She had trained in the use of EMT with her research supervisor, who is a trained EMT clinician prior to the implementation of the study procedures. Due to her direct involvement in the diagnosis, assessment and placement of children with ASD to a public school, she has first-hand experience in witnessing the challenges faced by families in their ability to access early intervention services and the financial constraints it had placed on families who were able to do so. Following diagnosis, in the Western Cape Province of South Africa, children with ASD are referred for specialised school placement and are placed on a centralised ASD waiting list (for access to government-funded schools). Children are then referred for an observation period at either or a school within their district (area where they reside) that caters for learners with ASD. A child may only be seen for an observation period after a

lengthy wait (between 12 to 24 months) and following a comprehensive 1-2 week assessment, school placement is determined. Immediate school placement is not guaranteed due to the increased demand for placement and lack of available space within these institutions. She noted that the children therefore spent most of their time with their parents at home, with limited to no intervention being implemented, while they await school placement. The result was that many of these children's language skills remained static and they entered the schooling environment with minimal language skills. This prompted the idea to explore whether EMT could effectively be implemented with young, minimally verbal children with ASD in their home environment in order to allow them and their families to gain access to evidence-based interventions and reduce the need to travel to access these services. As the children spend most of their time with their parents, it was also important to determine whether the potential skills they developed with the implementation of the EMT intervention strategies, could be generalised to use when interacting with their parents, outside of the therapeutic environment.

3.5 Equipment, Materials and Personnel

The following equipment, materials and personnel were used during the data collection phase of this study:

3.5.1 Equipment

All pre-intervention, baseline, intervention and post-intervention sessions were recorded using a video camera mounted to a tripod. Sessions were transcribed and analysed according to the conventions laid out in the Systematic Analysis of Language Transcript (SALT) software program (Miller & Chapman, 2008). A kitchen timer was used to time the sessions and alert the researcher once the allocated time was reached. The session's video data including the transcriptions and videos were uploaded to a secure server which was accessed via a unique login number and password. The coding team (4 people), the clinician (student researcher), the research supervisor and 2 co-investigators (1 qualified Speech-Language Therapist and 1 Speech-Language Therapy student) had access to the video recordings. The members of the coding team had received training in the ethical management of the data to ensure that participant confidentiality was maintained in the study. The 2 co-investigators regarded and upheld the confidentiality of the transcribed data. Once the transcripts were uploaded to the secure server, the co-investigators no longer had access to the video footage and transcriptions. The video footage remained on

the server for the duration of the study and will remain on the server until the study findings are published (see ethics considerations for more detail). The clinician was responsible for video recording the sessions and uploading the data to the secure server.

3.5.2 Assessment Materials

The children's language abilities were documented pre- and post-EMT sessions using formal assessment measures and informal protocols. The following assessment materials were used during the assessment process and are presented in Table 3.

Table 3.2: Assessment materials used during the study

Assessment materials	Administration time	Purpose	Validity and Reliability
The Preschool language scale (PLS-5) (Zimmerman, Steiner, & Pond, 2011).	30-40 minutes	This test was used to provide information on the child's communication interaction; as well as expressive and receptive language skills.	The PSL-5 has been validated on many children across different population groups.
A spontaneous language sample collected from a play-based activity (Owens, 2009).	20-minutes	This protocol was used to determine the number of spoken words and number of different words prior to the commencement of intervention, as well as to determine the Mean Length of Utterance (MLU).	Spontaneous language samples are relatively easy to use and analysis thereof yields results close to that of standardized testing (Pavelko & Owens, 2017).

The play-based activities used to gather the spontaneous language sample with the children during pre- and post-intervention made use of 6 toys kits that included: babies to feed and dress, farm set with animals and blocks, play dough, bubbles, cars with a ramp, and a lift-the-flap book.

3.5.3 Baseline and Intervention Materials

Each baseline and intervention session was 20-minutes in duration. A selection of age-appropriate toys that were chosen following the assessment procedures and were available during every session. Baseline sessions made use of toy kits that included building components (e.g., blocks, magnetic tiles) and symbolic play components (e.g., small figures representing agents, pretend foods, dolls). Examples of the toys used included a farm set (farm animals, a fence made of interlocking blocks, a farmer, a tractor and a barn), a racetrack and cars, magnetic plastic tiles, small dolls and animals, cut-able play-food (fruit, vegetables and sandwiches), play dishes and utensils, bubbles, playdough sets and a variety of hand puppets. Toys used in the intervention sessions were selected based on the types of toys that are readily found in pre-school classrooms that the children attended, were locally sourced and cost effective. Toy kits were purchased specifically for use during the intervention sessions of the study and included the following: interconnecting tracks with various additional items such as road signs and bridges, cars and a train; playdough with shape cutters and a playdough press; sandwich making set with plastic plates, knives and forks; sandwich making set with Velcro sides; a feedable monster soft toy; magnetic block tiles with additional wheel connections; and bubbles. Toys were arranged in two to three sets on the floor around a blanket that was used to define the play area. The remanding toy sets were kept in a zipped therapy bag that was easily accessible and were introduced over time. Each child obtained a toy kit on completion of the intervention sessions of the study.



Figure 3.1: Toy kits used during intervention sessions

3.6 Research Design

This study utilized a single case multiple baseline research design across participants (Gast, Lloyd & Ledford, 2018). Single case research designs have been used in various fields of research (Kratochwill et al., 2013). The use of single case research has been described as being rigorous and uses scientific methodology to outline causal relationships between independent and dependent variables (Horner et al., 2005). Participants in a single case design study act as their own control and data obtained regarding their performance before the commencement of intervention is used to compare it to their data of their performance during and after the intervention is implemented. This allows for the individual's performance to be tracked and studied so that evidence-based assessments of the results can be made using a relatively small sample size (Gast & Ledford, 2018). A predicted functional relationship between the intervention and change in the dependent variable can be documented using this design by examining visual analysis of the data and the resultant effect size (Parker, Vannest & Brown, 2009; Gast, 2010). The use of single case design to demonstrate the effectiveness of speech, language and communication interventions is evident in research due to it being a robust design with an achievable methodology (Vance & Clegg, 2012). The limitations of a single case research design are that results obtained are not generalizable across larger populations due to the small sample size (Kratochwill et al., 2013; Vance & Clegg, 2012). To demonstrate causal inference in the experiment, it is important that the single-subject research design used when implementing the intervention is replicable. It has not yet been agreed upon as to the number of replications that are needed to be able to make a conclusion regarding the effects of the intervention (Gast & Ledford, 2018). For interventions using a single case research design it is imperative that certain standards are followed in order to uphold the integrity of the design (Kratochwill et al., 2013). In order for single case studies to meet design standards, the following criteria must be adhered to; i) the independent variable must be carefully controlled by the clinician to determine when changes in the independent variable will occur, ii) to ensure the outcome variable is measured over time, iii) interobserver agreement for the dependent variable must be conducted, iv) the study needs to show an intervention effect in at least three attempts at different stages of the intervention, v) three data points are required in each phase in order to show an intervention effect (Kratochwill et al., 2013).

The current study investigated the effect EMT intervention had on a target behaviour (i.e. number of different words) of three children when introduced over a time. EMT as a language intervention using a single case design across participants has shown positive increases in language use and changes in complexity and diversity of language used in children with significant language delays (Kaiser & Hester, 1994) and children with Autism Spectrum Disorder (ASD) (Hampton & Kaiser, 2016; Hancock & Kaiser, 2002). The study proposed the use of a multiple baseline design across participants with each of the three children in order to answer the research question. Multiple baseline designs are known to be flexible and address any threats to internal validity and demonstrates the efficacy of the intervention (Gast et al., 2018). In multiple baseline design studies, pre-intervention data is obtained on the targeted behaviours prior to the introduction of the intervention (independent variable). Furthermore, there is no need to withdraw the intervention to demonstrate experimental control and each participant functions as his/her own control.

All baseline and intervention sessions were video recorded and the session's video data including the transcriptions and videos were uploaded to a secure server. Transcription and coding of the securely stored videos were conducted using the Systematic Analysis of Language Transcripts (SALT) (Miller & Chapman, 2008). The children were assigned when they would begin the intervention using a random number generator. Initially the targeted behaviours (total number of different words) shown by each child was measured during baseline sessions until a stable trend and level were established. Once stable trend and data with one child in baseline sessions was achieved, the independent variable (EMT intervention) was introduced. Continuous measurement of baseline behaviours across the other children took place concurrently. Acceptable baseline data for the targeted behaviours were collected for each child prior to the introduction of the intervention to assist with the prevention of threats to internal validity (Gast, Lloyd & Ledford, 2018). When the first child (Madison) showed an increase across 3 sessions for the target behaviour, the independent variable was introduced to the second child (Tariq) while continuing to monitor the behaviours of the third child (Andy) that remained in baseline. The independent variable (EMT strategies) was then introduced systematically until all the children had been introduced to the intervention. Thus, criteria for introducing the intervention procedures to the subsequent child included a shift in level and/or trend in the previous child's diversity of language used (number of different words)

compared to the baseline sessions. Some variability in the variety of words used across days is expected for children with ASD, but using a markedly larger variety of words would be a clear improvement over a fairly limited set of vocabulary as observed in baseline. Data on the dependent variables (number of different words) was collected after each EMT intervention session and then graphed for visual analysis. Visual analysis of data was conducted to show whether a causal relationship exists between the independent and dependent variable (Kratochwill et al., 2013).

The independent variable included the introduction of 6 EMT support strategies, including: 1) responsiveness, 2) modelling target-level language, 3) mirroring play actions and mapping those actions, 4) language expansions, 5) time delay protocols and 6) milieu prompting procedures (Hampton & Kaiser, 2016) (see Table 4 for details).

Table 3.3: Descriptions of EMT Support Strategies (adapted from Roberts, et al., 2014)

Phase	Strategy	Description
1	Responsiveness	• The adult pauses (>3s) after an utterance to allow the child time to reply or take a turn • The adult responds (within 2s) to all child communication attempts (verbal or gestures). • The adult maintains appropriate pacing of language models. • The adult mirrors and maps language onto play acts that are functional. • The adult uses language and inflection that mirrors typical conversation.
	Modelling target-level language	• The adult models language at the child's target level (1 out of 2 utterances). • The adult models diverse language and avoids using the same language models repetitively. • The adult models language that is functional and related to the child.

	Mirroring play actions and mapping those actions	• The adult mirrors the child by physically interacting with the materials the child is playing with and imitates their nonverbal behaviours (play). • The adult maps language onto these nonverbal behaviours to introduce functional vocabulary. • The adult paces their play mirroring so that they imitate more often than they model.
	Language Expansions	• The adult adds one or two content words to the child's previous utterance. • Content words are those that are specific and match the intent of the of the child's utterance.
2	Time Delay Protocols	• The adult attempts to elicit verbal and nonverbal requests from the child and labels these requests with specific language. • Time delays included overt nonverbal cues for the child to use language or waiting for the child to make a request. • Time delay strategies could include asking for assistance, inadequate portions, choice making, sabotage, silly situation, or waiting with a cue.
3	Milieu Prompting Procedures	• The adult uses a sequence of responses to a child's verbal or nonverbal request to elicit a verbal request from the child. • Milieu prompting procedures could include open prompts (e.g. "tell me what you want"), choice prompts (e.g. "do you want the car or the airplane?"), or a "say" prompt (e.g. "say ____").

The EMT strategies used were introduced to each participant in a three-phase approach. Once the EMT intervention was introduced to a child, the first phase of EMT intervention strategies were introduced, namely, responsiveness, modelling target-level language, mirroring play actions and mapping those actions, and

language expansions. Following 3 to 4 intervention sessions in a phase the second phase of EMT was introduced, which was characterised by the introduction of time delay protocols. The same procedure was followed when introducing the third and final phase of EMT intervention strategies, namely the introduction of milieu prompting procedures. The three EMT strategy phases are represented below:

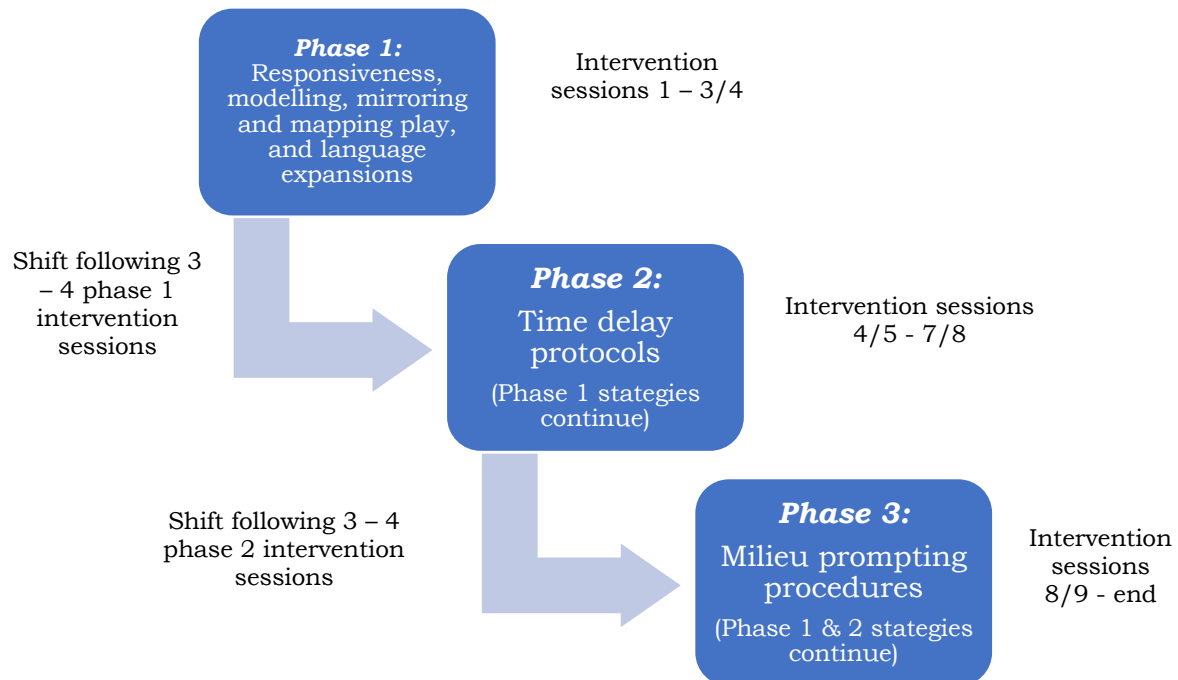


Figure 3.2: EMT Strategy Implementation Phases

3.7 Data Collection Procedures

Ethical approval for this study was obtained from the Human Research and Ethics Committee (HREC) prior to the commencement of this study: 433/2018 (Appendix C). Permission was obtained from the Western Cape Education Department (WCED) (Appendix D) to access potential school and child databases as well as from the principal of the targeted school (Appendix E). Written consent was obtained from the parents of each child prior to the start of the initial screening and assessment procedures. Examples of the participation consent and video consent letter sent to the potential participant's parents prior to the start of the study are available in Appendices A and B.

3.7.1 Pre-intervention and Post-intervention Procedure

Pre-intervention procedures were conducted prior to the commencement of the baseline sessions and post-intervention procedures were conducted 1 month

following the completion of the intervention. Subsequent to the obtainment of parental consent (Appendix A), assent from the child participant was obtained by asking them if they wanted to play. If the child indicated a positive response by nodding, verbalising yes, or approaching the toys or interventionist, then child assent was recorded. A 20-minute spontaneous language sample with the child and the interventionist was conducted (Owens, 2009). The language samples were used to obtain information about each child's production of number of different words (NDW), total number of words (TNW), their Mean Length of Utterance (MLU) in words, Brown's stages of morphosyntactic development (Owens, 2009) and the number of words used per minute, while interacting with the clinician prior to the start of the EMT intervention and following the completion thereof. The Preschool Language Scale (PLS-5) (Zimmerman, Steiner, & Pond, 2011) was used to gather information about the participant's auditory comprehension, expressive communication, and total language standard scores as well as each participants Growth Scale Values (GVS) before and after completion of the EMT sessions. The numerical value in GVS scores are used to measure small growth changes in language skills within subtests. GSV scores provide an indication of the children's language skills without comparing them to their peers (Kaufman & Kaufman, 2004). In addition, it is used to measure the efficacy of an intervention on a child's measured language skills (Kaufman & Kaufman, 2004).

Each of the pre- and post-EMT assessment sessions took place over 2 separate sessions and were conducted in a quiet room in an unfamiliar clinical setting. The children's behaviour was monitored throughout the sessions and if they displayed any signs of distress or discomfort which lasted for more than 10% of a session, that session was terminated. The possible signs of distress or discomfort included: being unresponsive, avoidant, withdrawn, increased activity levels, easily distracted, disruptive behaviour, or rocking.

3.7.2 Baseline Sessions

Baseline sessions were conducted prior to the commencement of intervention. Baseline sessions took place approximately twice per week for 20-minutes per session. As sessions occurred in the child's home, the clinician attempted to provide similarity across sessions by using the same mat that was placed on the floor with the toys, and the same room arrangement. A variety of toys were arranged on the floor in sets and were easily accessible to the child. The baseline sessions were child-

directed, and the clinician engaged with the child in play but did not make use of EMT intervention strategies during the sessions. Before baseline sessions commenced, assent from the child was obtained by asking them if they want to play. If the child indicated a positive response by nodding, verbalising yes, or approaching the toys or clinician, then child assent was recorded. The children's behaviour was monitored throughout the sessions in a similar manner to that described in 3.7.1.

The clinician responded to most of the child's nonverbal and verbal communication attempts by either using short exclamations ('wow', 'oh', 'hmm'), using sentences of 4-words and more, asking questions, or providing a direction. The clinician spoke often but did not balance turns nor match her input to the child's current level of language functions in terms of length and frequency. Sessions took place on the floor with the clinician sitting either alongside or in front of the child while playing but did not expand on the child's play or model new play acts. When necessary, behaviour support strategies were implemented in the form of redirection, positive reinforcement, ignoring problematic behaviour or visual support strategies. A timer was used by the clinician to indicate the amount of time remaining in the sessions. The same behaviour support strategies used in the baseline sessions were replicated in the intervention sessions.

3.7.3 Intervention Sessions

Intervention sessions occurred 2 to 3 times per week within the children's homes with a duration of 20-minutes. The room arrangement remained similar to those used in the baseline sessions though less toy sets were available when arranged on the floor and some were kept in clear, sealable bags to encourage requesting opportunities. The clinician engaged with the child in play, systematically implementing all of the EMT components including: a) following the child's lead and interests in play and communication, b) responding to all of the child's verbal and nonverbal communication attempts, c) modelling target-level language, d) mirroring (imitating) play actions and mapping (describing) those actions with target language, e) expanding the child's communication by repeating it and adding one content word, f) using time delay procedures to elicit communication with nonverbal cues, and g) using milieu prompting procedures to teach new language (Hampton & Kaiser, 2016).

Intervention sessions were introduced to Mason (participant 1) once stable baseline data was achieved following a minimum of five sessions while Tariq

(participant 2) and Andy (participant 3 remained) in baseline. Ensuring this allowed for the baseline data obtained to demonstrate that little movement had occurred in the frequency of the observed behaviour (NDW). Once a functional relationship between the dependent and independent variables was established for Mason, the EMT intervention was introduced to Tariq (participant 2), while Andy (participant 3) remained in baseline. When a functional relationship between the independent and dependent variables was evident for Tariq (participant 2), the intervention was introduced to Andy (participant 3). All sessions were video recorded, uploaded to the secure sever and transcribed using the Systematic Analysis of Language Transcript (SALT) software program (Miller & Chapman, 2008). The transcripts were then be coded using a predetermined coding system. An example of the transcription and coding can be viewed in Appendix F and the coding system viewed in Appendix G. The language used by the clinician was English. However, the child was credited for words used for any language they are exposed to outside of the research study. Intervention sessions were arranged with the children's parents weekly in advanced at predetermined days and times, but the researcher allowed for flexibility in schedules and accommodated requests to reschedule when needed.

3.8 Data Analysis Process

3.8.1 Dependent Measures

Data on the number of different words and the total number of words for each child was collected from each child's baseline and intervention sessions. A 10-minute segment starting from 3 minutes to 13 minutes for each session was transcribed and coded using the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2008) using a prescribed EMT code (Appendix G). Sessions were transcribed by the clinician, a qualified Speech-Language Therapist, or a student Speech-Language Therapist from the University of Cape Town.

3.8.1.1 Number of Different Words

Data on the number of different words (NDW) used by each child in baseline and intervention sessions were automatically analysed using the provided transcriptions with the SALT software. Words included in the analysis were specifically content words (nouns, verbs, proto-verbs, modifiers, and requesting words). Exclamations (e.g. 'wow' or 'uhoh') and non-specific words (determiners) used alone (this, that, those) were not counted. Additionally, words that functioned the same but varied in pronunciation were counted as a single word (e.g., no, nope, naw; yeah, yup, yes).

By providing information on the NDW, an estimate of the child's language (vocabulary) diversity could be made. This was selected as the primary dependent variable because diversity of target language use was expected to be the first behaviour to change during the intervention.

3.8.2 Intervention Fidelity

To ensure that the intervention was implemented consistently according to EMT protocol, 30% of baseline and intervention sessions for each child was rated. Fidelity sessions were randomly selected and the whole 20-minute session was rated. A trained EMT Speech-Language Therapist and Lecturer at the University of Cape Town rated the video for each 20-minute session using a 24-point checklist (see Appendix H for an example). Separate checklists were used to rate baseline and intervention sessions. Some examples of checklist items include:

- The adult models language at the child's target level.
- The adult models diverse language and avoids using same language models repeatedly.
- The adult uses 1-3 well-timed Time Delay Strategy's (TDs) in 10 minutes coded time.

Fidelity percentages were calculated as the number of checklist items the interventionist correctly implemented according to the session procedures during the 20-minute session divided by the total number of items on the checklist.

3.8.3 Generalisation Measures

For this study we collected a spontaneous language sample with parents in order to document generalization of the language gains. Data was obtained during a 20-minute spontaneous language sample with the child and their parent (Owens, 2009), in order to judge whether the language gains made during the intervention was generalized by the children to familiar communication partners who were not trained in implemented EMT. Spontaneous language samples were collected prior to the start of baseline sessions and one month after the conclusion of the EMT intervention. Parental consent was obtained to video record participant-parent play-based assessment sessions prior to and post intervention (Appendix B). Sessions took place in a clinical setting that different to those of the baseline and intervention sessions.

The pre- and post-intervention spontaneous language samples with the child interacting with their parent consisted of unstructured play in which the child was offered six different toy sets (i.e. play dough and shape cutters, baby dolls and bottles etc., cars and a ramp, a farm set, bubbles and a lift-the-flap book). The children were allowed to freely engage in play with the various toys while the parent was instructed to engage with them as naturally as they would normally. The toy sets differed to those used in the intervention but remained consistent for the pre- and post-intervention sessions. Data obtained from the spontaneous language samples included measures of the children's NDW and TNW used and allowed for comparisons to determine whether vocabulary gains made from clinician-implemented EMT was transferred to the child's spoken language interaction with their parents.

3.9 Ethical Considerations

To ensure the study complied with the ethical principles as outlined in declaration of Helsinki was adhered to (World Medical Association, 2013). The EMT intervention posed minimal risk due to it being play-based and non-invasive in nature. Empirical data has indicated that EMT has long term positive effect on the spoken language abilities of participants (Kaiser & Hester, 1994).

Assessment (pre- and post-intervention), baseline and intervention sessions were video recorded during the data collection phase. The session's video data including the transcripts and videos were uploaded to a secure server which was password protected. The following measures were incorporated to address the principles of autonomy and choice, beneficence, and participant confidentiality:

- Written consent was obtained from the participant's parents prior to the start of the study
- All procedures were explained in a written format to the participant's parents and reiterated throughout the data collection process
- Assent from the participant was obtained (nodding, verbalising yes, or approaching the toys or interventionist) before the start of all assessment, baseline and intervention sessions
- Participant behaviour was monitored for the duration of the sessions and if necessary sessions were to be rescheduled if the participant displayed any signs of discomfort or distress

- Confidentiality of participant's personal details was maintained at all times and no personal details was shared or stored on written session transcriptions or in reports
- The participant's parents had the right to withdraw the participant from the study at any time
- Feedback regarding the participant's progress was provided to the participant's parents during and after the data collection procedures
- The researchers contact details were provided to ensure the participant's parents were able to contact the research with any questions or queries.

3.10 Conclusion

This chapter provided a description of the research design chosen for this study. Sampling methods used, as well as participant descriptions, selection and exclusion criteria, and participant recruitment procedures were presented. Validity and reliability measures implemented in the study were discussed followed by the description the data collection procedures and the data analysis process. The chapter concluded by defining the ethical protocols followed during the study. The results obtained from the data analysis process will be discussed in Chapter 4.

CHAPTER 4: RESULTS

4.1 Introduction

The research question being explored in this study was: “Does clinician-implemented Enhanced Milieu Teaching (EMT) used within the home environment of families living within the Western Cape increase a child with Autism Spectrum Disorder’s (ASD) language abilities?” To answer to this question, the clinician determined if the use of clinician-implemented EMT within the home environment increased in total number of different words a child with ASD produced. Furthermore, it was necessary to determine whether the language gains made by the children during the intervention transferred (generalised) to the child’s spoken language interactions with their parents.

The study data was obtained through the use of single case, multiple-baseline research design (Gast et al., 2018). Visual analysis was used to evaluate the effect of EMT on NDW used. Intervention sessions included the introduction of the various EMT strategies in a staggered approach to each child. Intervention sessions 1 -4 included strategies that incorporated responsiveness interactions, sessions 5 – 8 included the introduction of time delay strategies, and sessions 9 – completion included the use of milieu prompting procedures. Pre- and post-intervention sessions were conducted using formal and informal assessment measures. Transfer of the child’s language skills were obtained through pre- and post-EMT sessions with the child and their parent. This chapter explores: the data analysis process; the integrity of the results including fidelity data and inter-rater reliability data; participant intervention results; and to conclude, generalisation of language use to familiar communication partners (parents).

4.2 Data Analysis Process

Child baseline and intervention sessions were video recorded and the session’s video data (including the transcriptions and videos) were uploaded to a secure server. The children participated in a minimum of 12 intervention sessions and a maximum of 18 sessions. A 10-minute segment starting from 3 minutes to 13 minutes was used for each session and transcribed and coded using the Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2008) using a prescribed EMT code that provided codes for the child’s levels of social engagement, communication for and the level of independence; the clinician’s level of responsiveness to the

participant's communication attempts, teaching strategies used by the clinician, and complexity of the clinician's responses (Appendix G). All sessions were transcribed by the clinician or by a final year speech therapy student therapist, or a qualified Speech-Language Therapist in South Africa. Results obtained from baseline and intervention sessions were tracked using the number of different words used (NDW) as the primary dependent variable. Results were plotted onto a graph to determine the effect of EMT on the NDW used by the participants.

Results obtained on the child's NDW are documented and described. Information for each participant and individual results are described separately and then the results are combined to discuss the overall treatment effect. Results are reported visually, and the percentage of non-overlapping data is reported as a measure for the magnitude of the effect (Lane & Gast, 2014).

4.3 Integrity of the Results

4.3.1 Fidelity Data

Fidelity measures were followed to ensure consistency of the intervention conducted during baseline and intervention sessions. To determine intervention fidelity for the baseline sessions, at least 30% of all baseline sessions for each participant were rated for fidelity. The same procedure was followed to determine intervention fidelity for the intervention sessions where at least 30% of all intervention sessions for each child was rated for fidelity. Sessions were chosen at random using a random number generator. A EMT trained Speech-Language Therapist and Lecturer at the University of Cape Town rated fidelity from video for the whole 20-minute session using a 24-point checklist (Appendix H). Individual checklists were used to record baseline and intervention sessions and fidelity percentages were calculated by dividing the number of checked items the interventionist correctly identified by the total number of items on the checklist.

Fidelity of implementation of baseline procedures was 91% (range= 83-98%) and fidelity of implementation of intervention procedures was 90% (range=85-98%).

4.3.2 Inter-rater Reliability Data

Inter-rater reliability during the transcriptions and coding procedures was followed across baseline and intervention sessions. A 10-minute segment, starting from 03:00 to 13:00, of each session was transcribed and coded from video using the

Systematic Analysis of Language Transcripts (SALT; Miller & Chapman, 2008) with specific EMT codes (Appendix G). The clinician initially coded all of the intervention sessions. A minimum of 30% of the sessions were externally coded for each child to assess reliability of the coding and sessions were randomly selected. Agreement was calculated using the exact agreement formula: the number of agreements divided by the sum of the agreements and disagreements (reference?). Inter-rater reliability of baseline sessions was 95% (range= 90-100%) and inter-rater reliability of intervention sessions was 93% (range=89-97%).

4.4 Participant Intervention Results

4.4.1 Participant 1: Madison

4.4.1.1 Participant 1: Family Circumstances

Madison was a single-child in a two-parent family during the duration of the study. Both his parents had post grade 12 certificates and were working full-time. No state provided grants were received and the family maintained a steady monthly income. Madison's parent's described their financial well-being in relation to their total financial income as "okay".

4.4.1.2 Participant 1: Description

Madison was 45 months old at the start of the study. His receptive language age equivalent (23 months) was higher than his expressive language equivalent (20 months) on the PLS-5. He had a limited expressive vocabulary and used limited spontaneous single words to primarily request or label objects or actions. He obtained a MLU of 1 during a 20-minute Language Sample taken with the clinician which included the spontaneous and elicited production of 14 utterances, mainly nouns and a few verbs. During the 20-minute Language Sample taken with his parent, he obtained a MLU of 1.2 and produced 13 spontaneous, imitated or elicited utterances consisting of primarily single words and a few 2-word combinations used to request and label objects or actions. During interactions with his parent he produced mainly nouns and a few verbs, with some descriptive words (colours) paired with a noun.

Baseline sessions took place at Madison's grandmother's house which was set up so that there were limited distractions for him and a quiet space for the clinician and Madison to interact. Sessions were regularly attended, and Madison's mother, father and grandmother attended the sessions. A total of 10 intervention sessions

took place in Madison's grandmother's home with the same routine being followed as during baseline sessions, after which point the family moved to a new home. Following the move, sessions with Madison were initially conducted in his playroom without his parents or grandmother in attendance. During this transition period he regularly wandered out the room or would stare out the window. Intervention sessions were later moved from the playroom to the family's living room so Madison's mother and father could be present. During the intervention period, Madison attended a preschool from early in the morning (7.30am) to late afternoon (5pm). At preschool he was expected to take a 1-hour afternoon nap, however this did not always happen. Intervention sessions occurred in the afternoon, during which he was frequently noted to be tired. This resulted in him being less responsive and engaged at those times. His spontaneous and imitated use of language reduced considerably on those days when it was reported that he did not have an afternoon nap at school compared to days when he did.

4.4.1.3 Participant 1: Intervention Results

During baseline sessions the clinician played and talked with the Madison using sentences of 4-words or more without making use of EMT intervention strategies. Madison's baseline sessions showed low stable results for NDW used, with him using 0 to 6 different words during baseline sessions. He received 2 baseline sessions per week for 3 weeks to establish a stable trend in the baseline data.

The intervention sessions imitated the baseline sessions in frequency and duration, except that the clinician implemented EMT strategies. For the first 4 intervention sessions, the EMT strategies used included responsiveness, modelling target-level language, mirroring play actions and mapping those actions, and language expansions. An immediate shift in the data level was demonstrated with Madison moving from a total of 0 to 6 different words to 12 different words in the first intervention session and 21 different words in the second intervention session. An increasing trend in the NDW used was further observed in subsequent intervention sessions following the introduction of EMT. Some variability in NDW was observed during intervention with Madison's NDW ranging between 9 to 21 different words during the initial 4 intervention session. Following a visual increase in NDW during the initial 4 intervention sessions (all 4 sessions' NDW used were above baseline levels), the introduction of time delay strategies was introduced in intervention session 11. A sudden decrease in NDW used was observed during

intervention session 13 which resulted in 5 different words produced. This variability was most probably due to a contextual factor in that Madison was tired and distracted as he had not had his regular nap at school that day. Although Madison was at ease in the session and easily moved between the different toys and willingly engaged with the clinician, he engaged in noncommunicative behaviours (humming and singing) for a considerable part of the session. This resulted in him not always readily responding verbally to the clinician's language attempts to elicit spontaneous language. An increase in NDW was once again observed in intervention session 14 which took place 2 days later and resulted in Madison using 20 different words. Following the steady increase in the number of different words used from phase 1 across sessions 11 – 14, the final EMT intervention strategy, milieu prompting procedures to teach new language, was introduced in intervention session 15. A decrease in NDW used was observed in intervention session 17. This was Madison's first session in his new home, and it was evident that he was adjusting to the novel environment which resulted in less language being used to engage with the clinician. All EMT components were used in the sessions ranging from intervention session 15 to the final intervention session 24. An upward trend in data was observed (with some variability) and Madison's NDW's ranged from 9 to 29 different words in a session. From intervention session 18 to 24, the frequency of the sessions dropped to one session per week.

Madison attended a total of 18 intervention sessions which commenced on September, 18 2019 and ended December, 17 2019. Percentage of non-overlapping data obtained showed that 94% (17 of the 18 sessions) of the NDW's data obtained in the intervention sessions with Madison was above the baseline sessions. When variability in NDW was observed it could be linked to contextual factors (such as changes in routine and living environment) as well as child characteristics (feeling tired as a result of not having an afternoon nap).

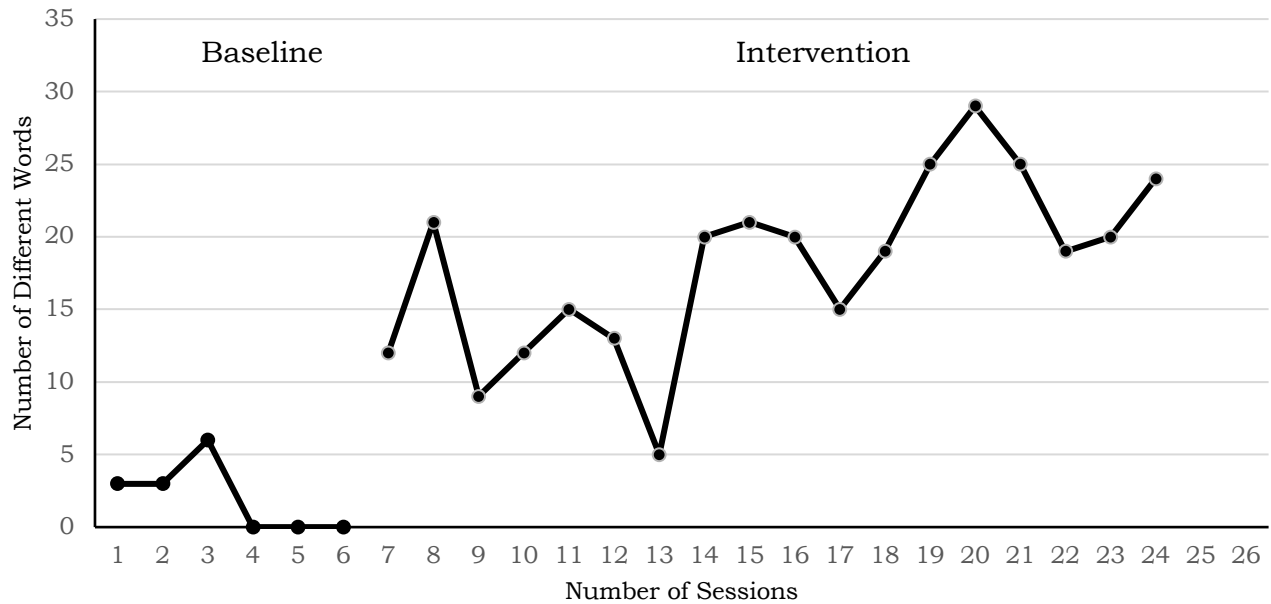


Figure 4.1: Participant 1 (Madison) – effects of EMT on language diversity (NDW)

4.4.2 Participant 2: Tariq

4.4.2.1 Participant 2: Family Circumstances

Tariq was part of a one-parent family (mother) and had a younger sister who was described by the mother as presenting with ASD characteristics. At the start of the study the family were living in a section of a house on a friend's property. During the study they moved into Tariq's maternal grandmother's house where they remained until the study was completed. Tariq's mother had a University education and was working on a contractual basis. No state grant was received and the mother described that she received wages that varied considerably every month. When describing the family's financial well-being in relation to their total financial income, Tariq's mother indicated that they were "just getting by".

4.4.2.2 Participant 2: Description

Tariq was 72 months old at the start of the study. His receptive language age equivalent (24 months) was higher than his expressive language equivalent (20 months) on the PLS-5. He produced spoken language to communicate his needs and to label items, but utterances were a mixture of intelligible and unintelligible words. He obtained a MLU of 1.9 during a 20-minute Language Sample taken with the clinician which included the spontaneous and elicited production of 17 utterances. He primarily used nouns with some pronoun-verb, determiner-verb and determiner-

noun combinations used. During the 20-minute Language Sample taken with his parent, he obtained a MLU of 1.7 and produced 23 spontaneous and imitated utterances which he primarily used to request and label objects or actions. He produced mainly nouns and a few verbs, with some determiners paired with a noun or auxiliary verb. Initially baseline sessions took place in the mornings at Tariq's home in the living room. Tariq's parents were separated, and Tariq lived with his mother and sister. During the intervention sessions, Tariq's mother and sister remained in a different room, with the door closed. Tariq's sister would persistently cry during the sessions which was audible and upsetting to him, despite the door being closed. It was decided that during Tariq's sessions, his mother or the nanny would sit with the sister next door until the session was completed. Tariq frequently brought additional toys with him to the sessions and would at times get distracted and want to search for other toys. A few weeks into the study the family moved out of their home and into an apartment with Tariq's maternal grandmother. Baseline sessions resumed in the apartment but the available space in the living room was much smaller. When intervention sessions were started, the sessions remained in the same environment as the baseline sessions to support him during intervention transitions. Sessions were irregularly attended and were often cancelled or rescheduled as the mother was either unavailable or Tariq was at his father's house. For a while Tariq was unable to attend sessions as he was visiting his father and could not return to his mother as his father's car had broken down. Tariq often had difficulty settling into the sessions, especially after a break in contact with the clinician, and some avoidant behaviour was evident but as his behaviour did not occur for 10% or more of the total session, it did not meet the criteria required to cancel the session. He would frequently show that he was hurt, though nothing was noticeable, or hide away during sessions, or start crying for no apparent reasons. This behaviour dissipated once sessions were regularly attended but increased again following longer periods when sessions were missed. Frequent verbal and physical outburst were observed either towards the toys (he would suddenly throw the toys and start shouting) and on a few occasions he would lash out at the clinician with no obvious preceding event that could attribute to this behaviour. Positive reinforcement was used by the clinician to address the behaviour and it was possible to calm him. For the majority of the sessions his mother remained in the home but not in the same room as him.

4.4.2.3 Participant 2: Intervention Results

During baseline sessions the clinician played and talked with Tariq using sentences of 4-words or more without making use of EMT intervention strategies. Baseline sessions showed low relatively stable results for NDW used with 0 to 7 different words being used in each baseline session. He received 2 baseline sessions per week for 5 weeks with a total of 10 sessions which took place in his home environment with his mother and sister in another room. Between baseline session 7 and 8, a three-week break occurred as Tariq went to visit his father and had not returned home due to car problems. Baseline sessions continued until a stable trend in the data for NDW was obtained (between 3 - 7 words) across 4 consecutive baseline sessions (sessions 7-10).

The intervention sessions imitated the baseline sessions in frequency and duration except that the clinician implemented EMT strategies. Responsiveness and expansions were used during the initial intervention sessions. No increase in the data level was observed following the first intervention session with the NDW remaining at 6 different words. However, a sudden shift in data level was observed during session 12 and an increasing trend following the introduction of the intervention with a range of between 18 and 20 different words during sessions 12 to 14. Following visual evidence of an increase in NDW during the intervention sessions 12 - 14, the use time delay strategies was introduced in intervention session 15. A further increase in the NDW was observed in intervention session 15 but a marked decrease in NDW was observed in intervention session 16 resulting in 12 different words produced. This could be linked to contextual factors unrelated to the intervention sessions, namely him being upset with his mother in that she did meet his requests (requests for additional toys to be brought into the session). This resulted in Tariq not being well regulated and he did not respond well to the time delay strategies being used. He showed frustration at times which was calmly addressed by the clinician, and he settled down and then readily engaged with her in the session following the use of positive reinforcement. In session 17 data increased again for NDW with a total of 25 different words produced. During sessions 15 to 17, the NDW used ranged from 12 to 27 different words per session. Milieu prompting procedures to teach new language, were introduced in session 18. All EMT components were used in the sessions ranging from intervention session 18 to the final session 22. An upward trend in data was observed with some variability following the use of all EMT components and Tariq's NDW ranged from 8 to 23

different words in a session. A noticeable decrease in the data for NDW was observed in session 22 with 8 different words produced. Again, this could be linked to contextual factors which included him being dysregulated in that he did not get his demands met by his mother. Additional intervention sessions were scheduled by the clinician, but the family were unable to commit to further sessions following session 22.

Tariq attended at total of 12 intervention sessions which took place twice weekly at his grandmother's home where he was living at the time with his mother and sister. Intervention sessions started on October, 16 2019 and ended on December, 09 2019. Percentage of non-overlapping data obtained showed that 92% of the NDW data obtained in the intervention sessions with Tariq were above the baseline sessions (11 out of 12 intervention sessions). Tariq's NDW used during intervention sessions was often influenced by his emotional state and general behaviour in the sessions as well as contextual factors such as inconsistency in routines at home and his demands not being met by his mother prior to the start of the intervention sessions. This often then resulted in him being dysregulated at the start of the intervention sessions or periods of being upset again during the sessions.

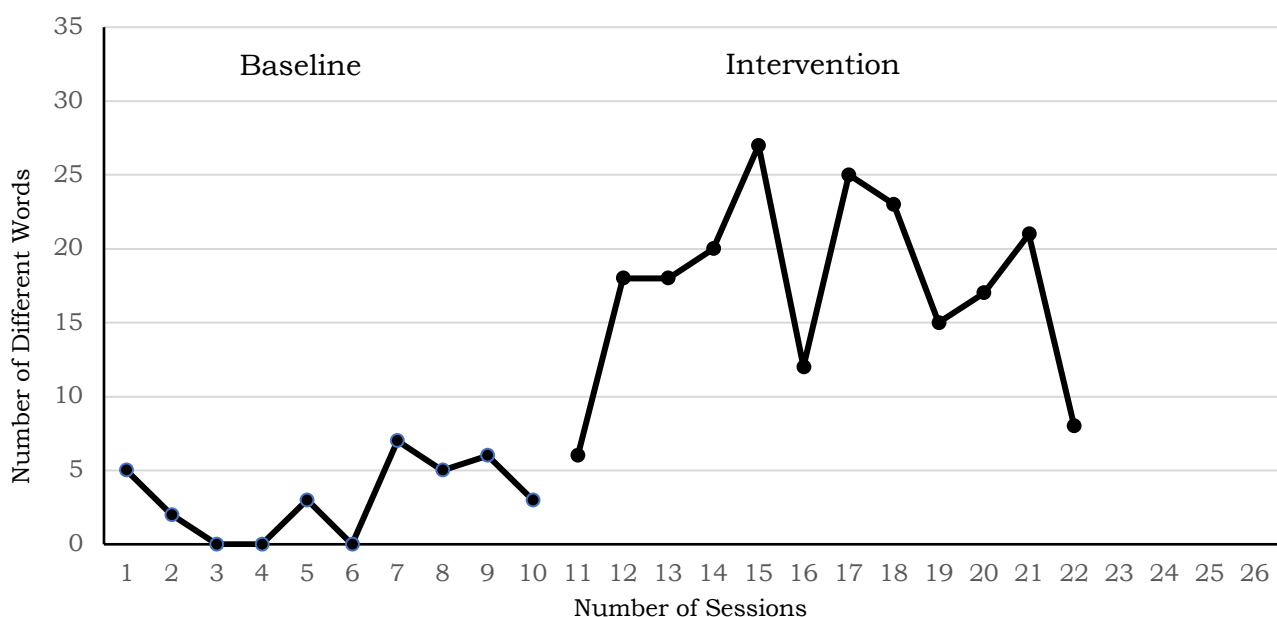


Figure 4.2: Participant 2 (Tariq) – effects of EMT on language diversity (NDW)

4.4.3 Participant 3: Andy

4.4.3.1 Participant 3: Family Circumstances

Andy was part of a two-parent family and had a younger brother who was diagnosed with ASD. Andy's father had a University education and was working full time and his mother had a grade 12 and was a Home Executive with her own side business. No state grant was received and the family maintained a steady monthly income through the father's salary. The family described their financial well-being in relation to their total income as "just getting by".

4.4.3.2 Participant 3: Description

Andy was 69 months old at the start of the study. His receptive language age equivalent (23 months) was higher than his expressive language equivalent (19 months) on the PLS-5. He used prelinguistic language in the form of vocalisations and gestures to communicate his needs and would imitate single words at times. He obtained a MLU of 1 during a 20-minute Language Sample taken with the clinician which included the production of one single noun word to label an object. During the 20-minute Language Sample taken with his parent, he obtained a MLU of 1 and produced just the same one single noun as with the clinician. Andy rarely spontaneously communicated and when he did it was through the use of vocalisations and/or gestures. The baseline and intervention sessions of the study took place in the living room of Andy's home with his mother and brother present. The sessions were regularly attended throughout the duration of the study. Initially having his brother present in the room posed a problem in that his brother wanted to engage with the toys and when he was removed from the room, he would start crying which inevitably led to Andy becoming distressed and upset too. It then took him time to settle into the session again and would often start crying or begin shouting again in the middle of the sessions. It was subsequently decided that Andy's brother would remain in a separate room during the duration of the intervention sessions.

An area was set up for the study sessions to take place in the home but as the space opened up to the rest of the home, Andy would at times get up and leave the room. He would often request for food or drink during the sessions or leave to go to the toilet. Frequent environmental distractions within the home would also cause him to want to leave the sessions. It was later addressed with his mother, and Andy

was adequately prepared for the sessions by including a photograph of the clinician on his visual schedule; by ensuring he ate and drank prior to the sessions, and by removing all distractions from his environment for the duration of the sessions. His brother was also taken to a separate room and sat with his mother which further helped to reduce distractions or events that could have been distressing to Andy. Though initially unaware of the camera in the room, towards the start of the intervention sessions, Andy developed a fascination with the video camera and would want to watch himself in the camera or look at the screen. This then deterred him from engaging in play with the clinician and when he was directed back to the sessions, he would shout and insist on wanting to return back to the camera. A visual task analysis and positive reinforcement “consequence” board was then introduced to redirect his attention and to address any potential negative behaviours displayed when needing to be redirected back to play and away from the camera. This further helped to set boundaries for him, and he more willingly returned to the sessions when guided by the clinician. Transitioning was at times difficult for Andy and during certain intervention sessions, his mother had to intervene to direct his behaviour or comfort him.

4.4.3.3 Participant 3: Intervention Results

Baseline sessions did not include any use of EMT strategies by the clinician who played with and spoke to Andy using sentences of 4-words or more. Baseline sessions showed low relatively stable results for NDW used with 0 to 2 different words being used in each baseline session. He received 2 baseline sessions per week for 7 weeks with a total number of 14 baseline sessions. These sessions took place in his home with his mother and brother present. His mother remained an observer during most sessions but at times had to intervene to help him settle into the sessions. A stable trend in the baseline data was observed and Andy produced between 0 – 2 different words. After 14 baseline sessions the EMT intervention was introduced.

The intervention sessions imitated the baseline sessions except that the clinician implemented EMT strategies. Responsiveness and expansions were used during the sessions 15-17. An immediate shift in the data level was demonstrated with an increasing trend following the introduction of intervention. In the first intervention session, Andy’s NDW shifted from 2 different words produced to 10 different words produced once the EMT intervention strategies were used. During the initial 3 intervention sessions, Andy used between 9 and 10 different words. Time delay

strategy was introduced during session 18 following a consistent increase in NDW, relative to baseline data. Sessions 18 to 20 further included the use of time delays and Andy's NDW ranged between 9 and 13 different words with limited variability across the sessions. The final EMT strategy, milieu prompting procedures was introduced in session 21. An upward trend in NDW data was observed with some variability following the use of all EMT components and Andy's NDW ranged from 9 to 19 different words in a session across all 3 EMT phases. The variability in data could be attributed to him going through a period of dysregulation which had been noticed across contexts that could have been attributed to the change in routine at home. Strategies were used to address this and helped him settle into the sessions again which aided in his ability to engage and participate during the intervention sessions.

Andy attended at total of 12 intervention sessions which took place thrice weekly at his home with his mother and brother in the house but in another room. Intervention sessions commenced on November, 12 2019 and ended December, 18 2019. Percentage of non-overlapping data obtained showed that 100% of the NDW data obtained in the intervention sessions with Andy were above the baseline sessions (12 out of 12 sessions). Variability in data could possibly be attributed to contextual factors (change in routines) and child characteristics (emotional state and being unable to express himself).

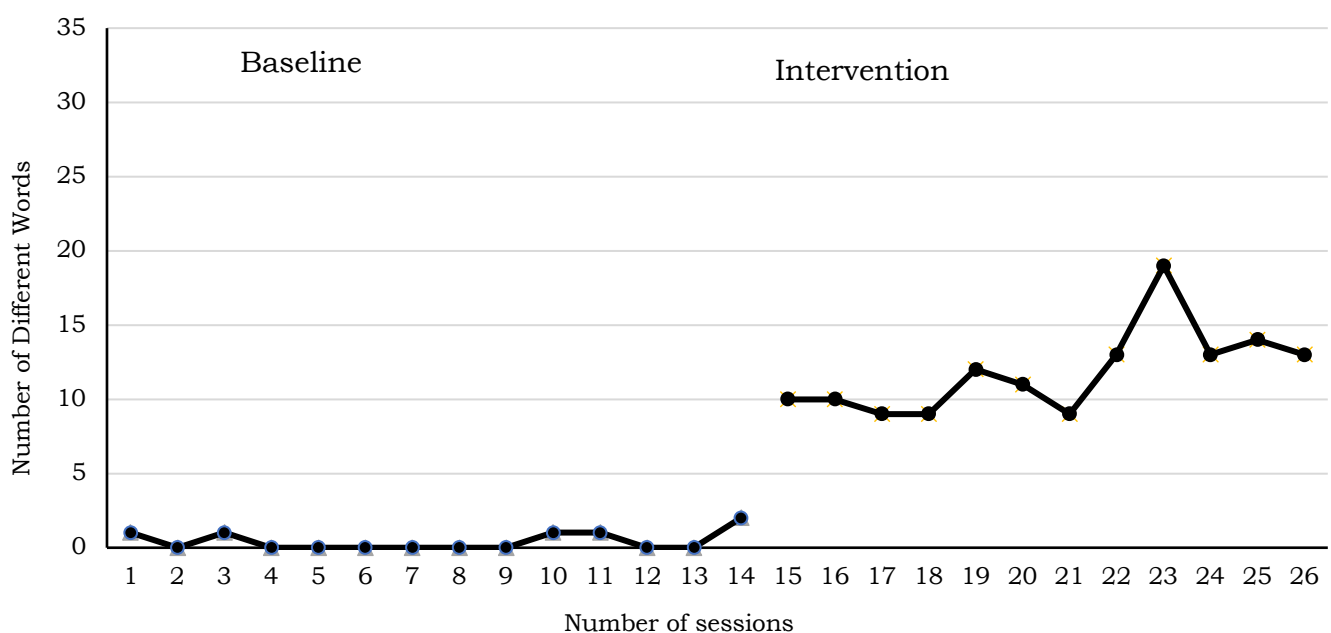


Figure 4.3: Participant 3 (Andy) – effects of EMT on language diversity (NDW)

4.5 EMT Effectiveness

4.5.1 EMT Effectiveness Across Participants

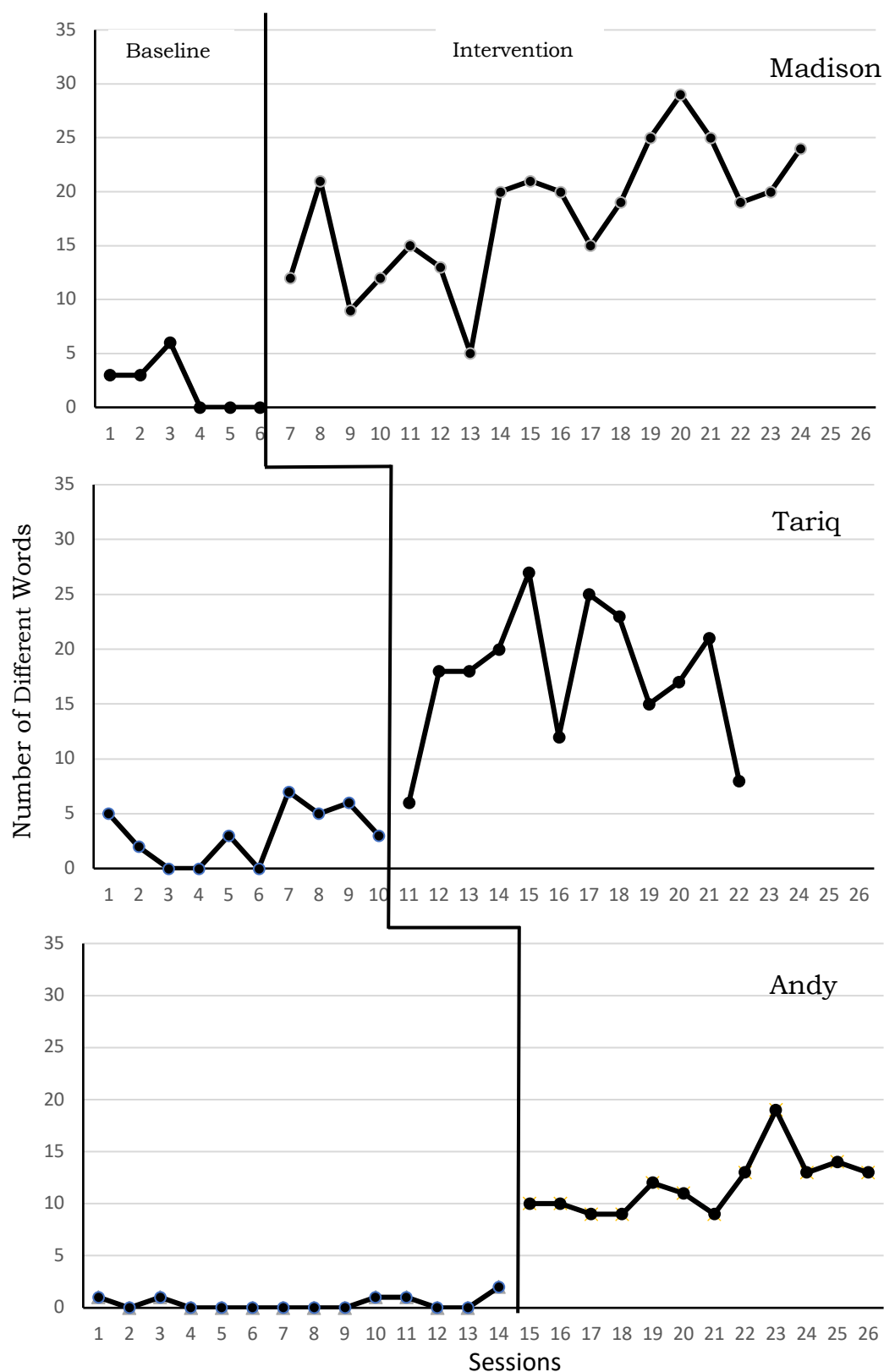


Figure 4.4: EMT intervention effect on language diversity (NDW) across children

All three children had low baseline data with very little variability in NDW (figure 4.4). The children used fewer than 9 different words in each baseline session. Each of the children demonstrated an immediate shift in level and an increasing trend following the introduction of the EMT intervention. A functional relationship was demonstrated between the introduction of EMT and an improvement of the NDW used for each participant, with at least 92% of the intervention sessions above the baseline level for all 3 of the children, although some variability occurred across sessions. This variability was due to contextual factors (such as moving to a new house, changes in routines at home, not having their demands met) as well as child characteristics (not feeling well, being tired).

4.5.2 Documenting Changes in Child Communication Abilities After EMT Intervention

Language skills were assessed for all 3 participants 1 month prior to the start of baseline sessions and again 1 month after the completion of EMT intervention sessions, and included the use of formal assessment measures and informal protocols. A 20-minute spontaneous language sample was conducted with the clinician and each child and involved unstructured play during which the children and were provided with six different toys sets (i.e. a play dough and shape cutters, baby dolls and bottles, a car and ramp, a farm set, bubbles and a lift-the-flap book) that were not used during the baseline or intervention sessions. The children were allowed to freely play with the clinician using the toys provided. No EMT intervention strategies were used during these spontaneous language samples. The language sample obtained recorded the child's language rate (words per minute), language diversity (NDW and TNW), and language complexity (Mean Length of Utterance (MLU) in words and Brown's Stages of Morphosyntactic Development), and this detail is represented in Table 4.1 below.

Table 4.1: Participants spontaneous language sample results: interaction with clinician

	Participant 1 (Madison)		Participant 2 (Tariq)		Participant 3 (Andy)	
	Pre- Intervention	Post- Intervention	Pre- Intervention	Post- Intervention	Pre- Intervention	Post- Intervention
NDW	14	31	18	19	1	16
TNW	14	64	29	33	1	70
MLU	1	1.56	1.71	1.83	1	1.83

Brown's Stage	Early I	Late I	Late I	II	Early I	II
Words per minute	0.70	4.15	1.45	1.85	0.05	2.70

Note: NDW = Number of different words; TNW = Total number of words; MLU = Mean length of utterance

In addition to a spontaneous language sample, a formalised assessment measure of receptive and expressive language, namely the PLS-5, was conducted pre- and post-intervention. The PLS-5 results indicated the child's receptive language comprehension, expressive language use and total language standard scores as well as each child's Growth Scale Values (GSV). Small changes in a child's language skills can be measured using GSV scores as Standard Scores often do not show evidential changes especially if the intervention is only implemented for a short duration. This data is presented in Table 4.1.

Table 4.2: Participants PLS-5 norm referenced scores and Growth Scale Values

	Participant 1 (Madison)		Participant 2 (Tariq)		Participant 3 (Andy)	
	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention	Pre-Intervention	Post-Intervention
Auditory Comprehension (AC)	58	58	50	50	50	50
Expressive Communication (EC)	59	60	50	50	50	50
Total Language Score	55	55	50	50	50	50
Growth Scale Values (AC)	379	393	384	420	379	420
Growth Scale Values (EC)	349	386	374	393	313	374

4.5.2.1 Participant 1: Madison

Results obtained from the language sample pre- and post-intervention for NDW and TNW used are presented in Table 4.2. Madison's diversity of language improved, namely his TNW's increased from 14 words in the pre-intervention spontaneous language sample to 64 words in the post-intervention spontaneous language sample. This translated to an increase of 50 more words produced during a 20-minute play-based session following the completion of the EMT intervention sessions. His NDW increased from 14 to 31 different words from the pre-intervention to post-intervention during the spontaneous language sample. This showed an increase of 17 different words used 1 month following the completion of the EMT intervention sessions. The complexity of his language improved, as reported in an increase in Madison's MLU from 1 to 1.56 following the implementation of the EMT intervention. In addition, pre-intervention MLU data indicated that he was in Brown's Stage Early I and post-intervention data showed that he was in Brown's Stage Late I for his morphosyntactic development. His rate of language used increased from 0.70 words per minute pre-intervention to 4.15 words per minute post intervention.

Standard Score (SS) values for the PLS-5 pre- and post-intervention are presented in Table 4.2 as well as the Growth Scale Values (GSV) which presents Madison's progress in his language skills following pre- and post-intervention data raw scores obtained. There was no improvement in his Receptive Language and Total Language SS, but an increase in his Expressive Language SS was evident. However, there was a noticeable increase in Madison's GSV in both the Auditory Comprehension and Expressive Language components of the PLS. These gains are noteworthy due to the short duration of intervention.

4.5.2.2 Participant 2: Tariq

Results obtained from the language sample pre- and post-intervention for NDW and TNW used are presented in Table 4.1. Tariq's TNW's increased from 29 words in the pre-intervention spontaneous language sample, to 33 words in the post-intervention spontaneous language sample. This translated to an increase of 4 more words produced during a 20-minute play-based session with the clinician, 1 month following the end of the EMT intervention sessions. His diversity of language, as measured by NDW increased from 18 to 19 different words from the pre-intervention to post-intervention during the spontaneous language sample. This showed a slight increase of 1 different word used 1 month following the completion of the intervention

sessions. This result obtained for Tariq could be attributed to his hesitant response to seeing the clinician in an unfamiliar clinical context following months of home-based sessions. For the duration of the study, it was evident that Tariq had difficulty with transitioning and changes. Tariq's MLU (in words) increased from 1.71 to 1.83 following the implementation of the EMT intervention which indicated an improvement in his complexity of language use. In addition, pre-intervention MLU data indicated that he was in Brown's Stage Late I and post-intervention data showed that he was in Brown's Stage II for his morphosyntactic development. Finally, his rate increased from 1.45 words per minute pre-intervention to 1.85 words per minute post-intervention, indicating that his rate of communication increased after a period of intervention.

Standard Score (SS) values for the PLS-5 pre- and post-intervention are presented in Table 4.2 as well as the Growth Scale Values (GSV) which presents Tariq's progress following pre- and post-intervention raw scores obtained. No change in his Receptive Language, Expressive Language, and Total Language Score SS's were evident. However, a noticeable increase in Tariq's GSV for his Auditory Comprehension and Expressive Language skills was shown, indicating progress made across the two areas of language following the implementation of EMT intervention.

4.5.2.3 Participant 3: Andy

Results obtained from the language sample pre- and post-intervention for NDW and TNW used are presented in Table 4.1. Andy's TNWs increased from 1 word in the pre-intervention spontaneous language sample, to 70 words in the post-intervention spontaneous language sample. This translated to an increase of 69 more words produced during a 20-minute play-based session with the interventionist, 1 month following the completion of the intervention sessions. His NDW increased from 14 to 31 different words from the pre-intervention to post-intervention during the spontaneous language sample. This showed an increase of 17 different words used 1 month following the completion of the intervention sessions. This indicated that Andy's language diversity improved following EMT intervention. Andy's MLU (in words) increased from 1 to 1.83 following the implementation of the EMT intervention. Pre-intervention MLU data indicated showed improvements in his morphosyntactic development in that he was in Brown's Stage Early I and post-intervention data showed that he is in Brown's Stage II. This indicates an increase

in the complexity of language Andy used. His rate increased from 0.05 words per minute pre-intervention to 2.70 words per minute post intervention which was a considerable increase in word per minute following the EMT intervention.

Standard Score (SS) values for the PLS-5 pre- and post-intervention are presented in Table 4.2 as well as the Growth Scale Values (GSV) which presents Andy's progress following pre- and post-intervention raw scores obtained. No change in his Receptive and Expressive Language, and Total Language Score SS's were evident. However, a noticeable increase in Andy's GSV for his Auditory Comprehension and Expressive Language skills was shown, indicating that progress made across the two areas of language.

4.6 Generalisation of Language Use to Familiar Communication Partners

A measure of transferability (generalisation) of skills was included following intervention to determine whether the additional vocabulary gains from clinician-implemented EMT were maintained to the child's spoken language interactions with their parents 1-month post-intervention. Data from a spontaneous language sample conducting with the participants interacting with their parents after intervention is displayed in Table 4.3. A 20-minute pre-intervention and post-intervention session was conducted to obtain data for NDW and TNW used during interactions with the child and their parent. Pre-intervention assessment took place 1 month prior to the start of baseline sessions and post-intervention sessions took place 1 month following the end of the intervention sessions. Both pre- and post-intervention sessions were conducted in an unfamiliar clinical context with the child and their parent. Each of these sessions involved unstructured play during which the children and were provided with six different toys sets (i.e. a play dough and shape cutters, baby dolls and bottles, a car and ramp, a farm set, bubbles and a lift-the-flap book) that were not used during the baseline or intervention sessions. The children were allowed to freely play with their parents using the toys provided. These sessions provided the opportunity to measure the child's use of language using materials that differed from those that were used in the intervention session to document the NDW and TNW they used with a familiar, untrained communication partner after intervention.

Table 4.3: Participants spontaneous language sample results: interaction with parent

	Participant 1 (Madison)		Participant 2 (Tariq)		Participant 3 (Andy)	
	Pre- Intervention	Post- Intervention	Pre- Intervention	Post- Intervention	Pre- Intervention	Post- Intervention
NDW	14	43	23	24	1	16
TNW	16	80	33	63	1	31

4.6.1 Participant 1: Madison

Results obtained from the parent language sample pre- and post-intervention for NDW and TNW used are presented in Table 4.3. Madison's NDW increased from 16 words in the pre-intervention session, to 80 words in the post-intervention session. This translated to an increase of 64 words during the 20-minute language sample. His TNW increased from 14 to 43 different words from the pre-intervention to post-intervention. This showed an increase of 29 different words used 1-month post-intervention when engaging in play with his parent in a 20-minute play-based interaction with their parent. The diversity of vocabulary and the rate of language used increased from pre- to post-intervention sessions indicating that he used a greater variety of words and he communicated more frequently with his parent following the implementation of the EMT intervention.

4.6.2 Participant 2: Tariq

Results obtained from the language sample pre- and post-intervention for NDW and TNW used are presented in Table 4.2. Tariq's NDW increased slightly from 23 to 24 different words from the pre-intervention to post-intervention sessions. This showed an increase of 1 different word used 1-month post-intervention when engaging in play with his parent in a 20-minute play-based interaction with his parent. This result obtained in NDW post-intervention could be attributed to his parents speaking considerably more during the 20-minute language sample post-intervention than during the pre-intervention spontaneous language sample and this resulted in limited opportunities for Tariq to use a larger variety of different words. Despite this, Tariq's TNW increased from 33 words in the pre-intervention session to 63 words in the post-intervention session. This translated to an increase of 33 words during the 20-minute language sample. Though there was little evidence of an increase in his diversity of language when interacting with his parent post-intervention, his rate of communication increased indicating he communicated more

frequently when engaging with his parent following the implementation of the EMT intervention.

4.6.3 Participant 3: Andy

Results obtained from the language sample pre- and post-intervention for NDW and TNW used are presented in Table 4.2. Andy's NDW increased from 1 different word being produced in the pre-intervention session to 16 different words being produced in the post-intervention session. This showed an increase of 15 different word used 1-month post-intervention when engaging in play with his parent in a 20 minute play-based interaction with his parent. His TNW increased from 1 word in the pre-intervention session to 31 words in the post-intervention session. This translated to an increase of 30 more words being produced during the 20-minute language sample with his parent. This indicated that Andy was using a greater diversity of vocabulary when engaging with his parent following the implementation of the EMT intervention. His rate of communication also increased post-intervention showing that he used language to communicate more frequently with his parent following the implementation of EMT.

4.7 Conclusion

This chapter presented findings from home-based clinician-implemented EMT intervention on the language abilities of 3 children with ASD living in the Western Cape. A single case, multiple-baseline research design (Gast et al., 2018) was used and results were graphically displayed and visual analysis was used to evaluate the effect of EMT on NDW used. All 3 children demonstrated an improvement in the NDW used with some variability across sessions. Generalisation of language gains to untrained communication partners (participant's parents) was measured 1-month post-intervention and results indicated increased NDW and TNW for all 3 children when compared to pre-intervention results.

CHAPTER 5: DISCUSSION

5.1 Introduction

The main objective of the study was to determine whether clinician implemented Enhance Milieu Teaching (EMT) could effectively be used within the home environment of families living within the Western Cape of South Africa to increase a child with ASD's spoken language abilities, in particular the total number of different words used. During the clinician implemented EMT pre-intervention and post-intervention assessments, data on the three children's number of different words (NDW) and total number of words (TNW) used was gathered and analysed to document possible changes in the child's communication abilities. All 3 children were described as being minimally verbal at the commencement of the study's intervention, using less than 20 different words and/or 1 word or less per minute in a 20 minute spontaneous language sample. Results from this study suggest that EMT delivered in the home-based context of a child with ASD by a trained clinician is an effective method for increasing the spoken language abilities of all three children who participated in the study. Increases in NDW used by the three children were similar to those obtained in EMT intervention studies conducted in developed countries (Goldstein, 2002; Hampton & Kaiser, 2016; Kaiser, Hancock, & Neitfeld, 2000) as well as previous research conducted in South Africa (Hampton et al., 2019).

As like in many LMICs, South Africa has limited services available for early diagnosis of ASD and access to effective early intervention services for children with ASD and their families (Schlebusch et al., 2020). This invariability creates a considerable amount of family stress due to the lack of cost-effective support and the increased burden this places on these families to care for their child with ASD (Schlebusch, Samuels, & Dada, 2016). Support services that are available in South Africa are either sporadic or very costly (de Vries, 2016). Speech-Language Therapists (SLTs) are specialist trained and regularly involved in the management of children with ASD due to presenting communication and language disorders, especially in LMICs (Wylie, McAllister, Davidson, & Marshall, 2016). In South Africa, the need for SLTs to provide services for children with ASD and their families far exceeds the available reach of these highly skilled professionals, especially due to many children with ASD receiving a late diagnosis, and therefore not accessing essential early intervention services. This therefore leaves many children with ASD and their families without much needed intervention and care, or services received are limited

and therefore unsustainable (Pillay et al., 2020). Dissemination of evidence-based intervention services is therefore needed in South Africa, where resources are limited and the number of children diagnosed with ASD is increasing (Franz et al., 2018). There is growing support for research into the adaptation and use of NDBIs in resource limited contexts, due to the flexible nature of the introduction of these evidence-based interventions in a child's natural learning context, as well as the use of socially and contextually relevant activities that are child-directed (Schlebusch et al., 2020). As EMT is a NDBI that targets language development through child-led play interactions (Roberts & Kaiser, 2015), the implementation thereof in resource limited contexts like South Africa has started to be investigated (Hampton et al., 2019). In this chapter, conducting EMT within the home environment of children with ASD in the Western Cape of South Africa will be discussed in terms of the feasibility, the effective implementation thereof, as well as the functional benefits of the intervention.

5.2 Discussion of Key Findings

ASD is described as being a major global health challenge (Guler et al., 2018) and the majority of individuals with ASD are believed to be living in LMIC (de Vries, 2016). In South Africa, numerous challenges exist for children to receive a comprehensive assessment and diagnosis due to the complexity of the process (Malcolm-Smith et al., 2013). For many of these children, a delayed ASD diagnosis may result in children with ASD not accessing early intervention services, and the consequence thereof may be poor language development (Ruparelia et al., 2016). A retrospective case review conducted in South Africa by Springer and colleagues found evidence of racial disparity in spoken language abilities of newly diagnosed ASD children, with 94% of black African children and 77% of mixed ancestry children presenting with minimal verbal language abilities compared to 42% of Caucasian children. The disparity noted in verbal language abilities were believed to be equated to socio-economic factors acting as a barrier to accessing early intervention services (Springer et al., 2013). This study demonstrated similar findings in that the children participating in the study were minimally verbal at the time of their diagnosis and had received little to no early intervention due to the family's difficulty accessing available and/or cost-effective support services in the public and private sector.

Early intervention services in South Africa that are cost effective are minimal and not readily available, resulting in many children with ASD and their families either

not receiving early intervention or having to finance the cost thereof themselves (Guler et al., 2017; Mitchell & Holdt, 2014). South Africa's history of misalignment of appropriate policy development for early intervention with that of effective implementation has further impacted on available resources and infrastructure for families to access intervention services (Samuels, Slemming, & Balton, 2012). To address the need for the development of and access to evidence-based interventions to support persons with ASD, it is vitally important that national policies are developed and implemented (Franz et al., 2018). A recent examination of the national child and adolescence mental health policy in South Africa demonstrated that despite the existence of the national policy, no province within the country has a child and adolescent mental health policy or any identifiable implementation plans to support the national policy (Mokitimi, Schneider, & de Vries, 2018).

In the Western Cape of South Africa, although being one of the provinces described as having better public healthcare resources, it remains a grave challenge for families to access early diagnostic and intervention services for children with ASD (van Schalkwyk, et al., 2016). If a child is suspected to have ASD, it may take anything from 9 to 18 months or more for a child to receive a diagnosis via the public health sector. Following the ASD diagnosis, the child is referred for intervention and may receive a short period of more intensive intervention or else be seen every four to six weeks by an occupational therapist or speech-language therapist at a tertiary hospital while they await placement at a public school. Furthermore, it was reported that in 2016 in the Western Cape, 940 children with confirmed ASD diagnoses were placed in Special Education Schools, and 744 were still awaiting school placement. Of those children awaiting placement, 87% (646 children) were under the age of 7 years old (Pillay, Duncan, & de Vries, 2018). It is therefore believed that in South Africa, ASD is fast becoming a public health concern due to both the public and private sectors being unable to provide to the growing need for intervention and support for young children with ASD and their families (Franz, et al., 2018). Moreover, very few early intervention studies have been conducted in South Africa and the need to identify and develop interventions for this context is pertinent due to the ever-rising number of young children being diagnosed with ASD (de Vries, 2016).

5.2.1 EMT is Effective and Leads to Language Improvement

The current study aimed to address the expanding need for evidence-based early intervention research in the Western Cape of South Africa to offer possible solutions to providing children with ASD and their families with intervention that is feasible and effective. Research into the feasibility and effectiveness of early communication intervention in developing countries has shown significant evidence that these interventions improve children with ASD's communication skills (Goldstein, 2002; Hampton & Kaiser, 2016; Paul et al., 2013; Zwaigenbaum et al., 2015). Improvements in communication skills demonstrated to have an impact on children with ASD's later social skills and academic achievement (Gillespie-Lynch et al., 2012; Magiati et al., 2014). Early intervention for children with ASD has proven to be crucial for various reasons, including that children between the birth and 6 years of age are best able to acquire social and language skills due to the brain's neuroplasticity which supports increased complex brain circulatory systems that that promote development (Landa, 2007). Furthermore, early intervention provides support to parents and caregivers of children with ASD to empower them and reduce possible family stressors which further demonstrates the need for clear policy implications (Franz et al., 2018). In South Africa, children access early intervention services in either the public or private sector either through referrals from health care or education professionals, or at times self-referral (Samuels et al., 2012). Families accessing early intervention services in the public sector may face constraints due to the overburdened health system and the limited number of available healthcare professionals, as well as the increasing need for specialised school placement for children with ASD and the extensive waiting list in the education sector (Pillay et al., 2020; Samuels et al., 2012). This reality therefore requires critical thinking around ways to integrate ASD services into existing service delivery models and determining which individuals can facilitate the implementation of these services (Schlebusch et al., 2020).

By enrolling children to participate in this study who had received a diagnosis of ASD but were awaiting school placement, showed whether the use of EMT intervention provided functional benefits to those children not yet receiving intervention services. Furthermore, by providing children with ASD and their family with intervention within their home environment, the aim was to possibly alleviate the burden placed on families when needing to access intervention services.

The results from this single case, multiple baseline study demonstrated that EMT was an effective intervention for children with ASD when implemented within a home context in a LMIC, such as South Africa, to increase their spoken language abilities. Though the three children in this study represented a small percentage of the demographic of children with ASD in the Western Cape of South Africa, it highlighted the significance of implementing an early intervention programme to address the spoken language performance of these children. Prior to the start of the EMT intervention, all three children presented with minimal verbal language (had a minimum of 1 and a maximum of 20 different spoken words) and with the implementation of the EMT intervention, all three participants demonstrated an almost immediate upward shift in their data trend in terms of number of different words (NDW) used following analysis of a 10-minute segment of sessions. All three children demonstrated overall gains in their NDW used following the implementation of the intervention over relatively few intervention sessions (mean number of intervention sessions=14) at a low dosage (20 minutes per session with a total intervention time of 8-10 hours). Despite some variability in the data trends across the 3 children during the intervention sessions, the percentage of non-overlapping data between the baseline and intervention sessions were above 92% for all 3 children. These findings are congruent with reports from literature suggesting that EMT can successfully be implemented in low-resource settings (Hatcher & Page, 2020). The study further extends on previous EMT research conducted in South Africa which used the same research methodology (single case, multiple baseline design) to study the effects of EMT on the diversity and frequency of 3 children with ASD's spoken language ability in a controlled context (a clinical setting within a school) (Hampton et al. 2019). The implementation of EMT in a complex environment (the child's home context), demonstrated effects similar to those found when implemented in a controlled environment in that all three children made increased gains in diversity of language used (NDW) and increased communication interactions (TNW). The study contributes to the growing need for cost and time effective, evidence-based early communication interventions for children with ASD in South Africa and moreover to the ever-expanding need for evidence-based early interventions for young children with ASD within developing countries (Schlebusch et al., 2020). This is of particular importance due to the rising numbers of young children being diagnosed with ASD and the lack of readily available, cost-effective support and intervention services available in LMICs, such as South Africa (Franz et al., 2018).

5.2.2 EMT is Applicable in a Low Resource Context

This study contributed to the need to demonstrate the applicability of an evidence-based early intervention approach (EMT) in a limited resource context. In resource limited contexts, such as in South Africa, it has been proposed that the focus of intervention services provided to children with ASD be feasible and sustainable (Schlebusch et al., 2020). Due to the health care system being overburdened in South Africa and with no clear protocols around child development being implemented, monitoring of children's developmental progress is not readily achieved (Samuels et al., 2012). Children with ASD undergo a lengthy diagnostic process in the public sector, which is most often initiated by parental concerns, and could take between 9 to 18 months, or longer, for a comprehensive diagnosis (Franz et al., 2018). Subsequent to diagnosis, children with ASD are placed on a waiting list for specialised school placement within the public education sector, which typically involves a 1 to 2 year wait until placement is confirmed (Pillay et al., 2020). The diagnosis process in the private sector is not as lengthy as that of the public sector but is costly (Eramus et al., 2019; Schlebusch et al., 2016). Most recent data in South Africa showed that of the 940 children with ASD attending schools, 81% attended public, government-funded schools and only a small number of these children were 5 years old or younger showing limited availability in the public education setting for provision of early intervention for children with ASD (Pillay et al., 2020). The remaining 19% of children with ASD attend private funded schools which accommodated placement of children at a younger age. The resultant impact of children with ASD not being placed in a school setting at a young age in the public sector is that they have limited or no access to early intervention, which is compounded further in that most children with ASD and their families are not able to afford private services (Pillay et al., 2020).

In order to address the great need for interventions while recognising that resources are limited and family's have varied restrictions to accessing health services in South Africa, researchers proposed that investigations of possible feasible interventions should involve 'borrowing' from early ASD interventions with proven positive results (Schlebusch et al., 2020). This comprises of work from implementation science which highlights the benefits of developing on existing evidence-based research that demonstrates effective intervention, through the implementation thereof in different contexts (Damshroder et al., 2009, Pfadenhauer et al., 2017). By using these existing evidence-based interventions and applying them

in resource limited contexts it could save considerably on time and costs involved and move towards adaptations thereof to be practical for use in the South African context (de Vries, 2016).

This study's demonstration of EMT being an effective intervention to increase children with ASD's spoken language abilities when implemented in the home context of these families living in the Western Cape of South Africa, contributes to the feasibility of disseminating evidence-based practices in various contexts. For all three children in the study and their families, access to cost-effective intervention was affected by various contextual and personal factors. Two of the children's families lived 30-minutes outside of Central City Metropole with the one family not having access to their own private transportation and therefore home-based intervention reduced their travel expenses and time, while the third child's parent's worked full time making it difficult for them to access services for their child. All three children's parents had indicated that financially it was challenging to access private intervention services due to the cost implications. The children's parents expressed that having the EMT intervention implemented in their home environment provided relief to them both financially and timewise. These findings are similar to those of Guler et al. (2018), who found that caregivers of children with ASD living in South Africa showed a preference towards early intervention approaches that were home-based and individualised. Considerations were made in this study to ensure the implementation of the EMT intervention occurred in natural play interactions between the clinician and child. Furthermore the clinician was aware that in a home context setting changes in the child's routine could have an effect on their behaviour. The toys selected and used during the intervention sessions were readily available from local stores, inexpensive and of interest to the children. Even though toys were provided for the children in this study, it is necessary to be cognisant that many families of children with ASD in South Africa are not able to access or afford resources such as toys or books, and interactions between children with ASD and their parents comprise mostly of daily, routine activities (such as mealtimes, or bath times) (Ramseur et al., 2019). Thus, clinicians need to be sensitive to whether EMT should be embedded in play or in everyday routine activities. Notwithstanding, this study contributes to the data which indicate that evidence-based interventions can be implemented within the home context and adapted to incorporate family's needs (Schlebusch et al., 2020).

5.2.3 Language Gains are Generalised to Familiar Communication Partners

This study demonstrated various functional benefits of implementing EMT in the home context of children with ASD living in the Western Cape of South Africa in that that increases made in the children's spoken language abilities, including increases in language diversity (NDW) and communication attempts (TNW), were transferred to use with a familiar, *untrained* communication partner (parent) during a 20 minute spontaneous language sample, 1-month after the completion of the EMT intervention. Similarly, increases in language diversity (NDW) and communication attempts (TNW) were maintained to use with a familiar, *trained* communication partner (clinician) during a 20 minute spontaneous language sample, 1-month after the completion of the EMT intervention. The post-intervention assessment measure with the children and their parent as well as with the children and the clinician was conducted within an unfamiliar, clinical context using novel materials (toys). Generalisation of increased language abilities (NDW and TNW) following the implementation of EMT intervention in the home context of children with ASD in South Africa, corresponded to findings in a previous study which demonstrated generalisation of increased language abilities in children with ASD to a familiar, untrained and familiar, trained communication partner following the implementation of EMT intervention in a clinical context (Hampton et al., 2019). Results indicated that EMT implementation by a trained clinician within the home context of children with ASD is as effective as when implemented by a trained clinician in a controlled, clinical contexts, to ensure for generalisation of acquired language skills to familiar communication partners following the completion of the EMT intervention. This is an important step towards addressing the needs of children with ASD in South Africa, as the reality of the situation is that many children with ASD are unable to access evidence-based early intervention and/or are still awaiting school placement (Pillay et al., 2020; van Schalkwyk et al., 2016).

Studies conducted in South Africa have highlighted the importance of contextual considerations when implementing early interventions for children with ASD to ensure for transferability of skills between settings and people (Guler et al., 2018; Samuels et al., 2012; Schlebusch et al., 2020). In a study conducted by Guler et al. (2018), caregivers of children with ASD living in South Africa reported that their child had difficulty transferring skills learnt in a clinical context to the home context due to disparities in available resources (lack of toys) and the environmental setup

(chaotic home environments). Caregivers noted a preference towards home-based early interventions for their child with ASD due to the convenience thereof and the fact that it provides an opportunity for the clinicians implementing the intervention to better understand the family's home context and the child's abilities and behaviours within the home (Guler et al., 2018).

5.2.4 Contextual and Family Factors Impacting on EMT Implementation in the Home Context

By increasing the children's spoken language ability and demonstrating generalisation of these skills to their parents, as well as providing EMT intervention in the child's home environment, it alleviated some of the family's stressors around accessing services needed for their child to develop. Research has emphasised the increased prevalence of family stress related to parents having a child diagnosed with ASD (Plumb, 2011; Schlebusch et al., 2016) and the additional stress caused by their ability to access support services for themselves and their child (Fewster et al., 2020; Kapp & Brown, 2011). In South Africa, many families report an extreme financial burden placed on them to provide their child with ASD treatment, and considerable sacrifices are made to cover the costs thereof, which includes the cost of travelling to and from sites to access treatments (Mthombeni & Nwoye, 2018). Traditionally interventions have focused primarily on the child with ASD with little emphasis on support for their parents or caregivers, though recently a positive shift in focus within the South African context has resulted in the inclusion of parents or caregivers in the management of the child with ASD (Fewster et al., 2020). In spite of this, gaps in interventions provided to children and their families in South Africa include limited support for parent's or caregiver's emotional wellbeing (stress management and management of their mental health). In order to obtain optimal results for children with ASD, the emotional wellbeing of their parents needs to be considered and evidence-based early interventions additionally need to address the social, emotional and health needs of the parents (Fewster et al., 2020).

Madison's, participant 1, family frequently expressed their concern around his future school placement and whether he would benefit sufficiently from the programme offered at a public ASD specific school. Further factors contributing to their concerns centred around their ability to provide Madison with the best possible care and protection, and this included their fear of how society perceives him due to his "differences". During the intervention process of the study, the family moved

houses in order to have a home where they could provide more space for Madison, which too created additional worry. Madison's family were very involved in this study's process and either one or both of his parents and/or his grandmother attended the baseline and intervention sessions. Consolidation of observed clinician implemented EMT intervention strategies was displayed by the family in their engagement with Madison during daily interactions. The family maintained a familiar and structured daily routine with Madison, as well as showing consistency in their management of his social, emotional and behavioral characteristics. As both his parent's worked full time, Madison attended playschool daily from 8am to 5pm. Due to the family's commitment to and involvement in the study, the implementation of the EMT intervention sessions were conducted regularly on specific days and at specific times, which contributed to the effectiveness of the EMT intervention implementation. The family openly communicated their concerns and challenges with the clinician, who was able to guide them through possible intervention strategies and support them going forward.

Tariq, participant 2, came from a family with separated parents who were no longer living in the same home together. Tariq visited his dad on different days and for varying lengths of time. The clinician had no contact with his father and all communication was conducted with his mother. At the commencement of the study, Tariq's mother reported that she was concerned about her younger daughter, and that she was in the process of getting her assessed for a possible ASD diagnosis. Family stress in the form of difficulty accessing services for her children was expressed by Tariq's mother, as well as being able to adequately provide for all the needs. At the time of the study, Tariq was not attending school and his daily routine was unstructured. As his mother worked part time, she was inconsistently at home during the EMT intervention sessions. Additionally, Tariq's sister had to be removed from the room where the EMT intervention took place which resulted in her crying persistently, which invariably upset Tariq, and resulted in his mother not being present during the sessions. Regular feedback was provided by the clinician as well as discussions with Tariq's mother as to possible strategies that could be used to address his development in his daily routines and play. Tariq was currently on the waiting list for school placement, and his mother expressed great concern about him attending school and his safety and development. It was evident that Tariq was easily upset by changes in his environment as well as when restrictions were placed on him at home. This resulted in negative behavioural outbursts during the EMT

intervention sessions, or him being dysregulated. During the study, the family moved to a smaller living space to reduce expenses and often Tariq was unavailable to attend EMT intervention sessions due to him not returning home for long periods of time when visiting his father. This resulted in inconsistency in implementing the EMT intervention and Tariq often required time to settle back into the intervention process and familiarise himself with the clinician. The importance of consistency and routines was discussed with Tariq's mother but due to family and contextual circumstances, the implementation thereof was not readily maintained.

Andy, participant 3, lived with both parents and younger brother who too had an ASD diagnosis. Prior to the start of the study, Andy had recently been placed in a ASD school but was not receiving individualised intervention at the time. Andy's father worked full time while his mother was unemployed but expressed that she was struggling to find a job with flexible hours that worked around her having to look after two children with ASD. Andy's family indicated that their main concern was being able to provide him with the best possible intervention and ensuring his development and happiness. The family followed a relaxed daily routine, but the use of a daily visual schedule was evident in the house. The family took great interest in the EMT intervention process and regularly asked the clinician questions and shared concerns. Andy's brother had to remain in a separate room resulting in his mother not being able to always be present during the EMT intervention implementation. Regular communication and feedback with his family by the clinician was maintained and they were willing to attempt strategies recommended by the clinician. Sessions were regularly attended and EMT intervention implementation was consistent.

Guralnick (2020) highlighted the significance of coordinating early interventions where aims directed at children's progress is integrated with the family's needs to address the potential aforementioned family stressors. Functional outcomes of intervention are interlaced with targeting child goals in different contexts and environmental settings. Implementation of successful interventions rely on a clear understanding of how family patterns of interaction effect the success and maintenance of these interventions. It is also important to note, how child patterns create family stressors, which could affect the functional implementation of an intervention. During the implementation of the EMT intervention sessions, a clear relationship was displayed between the child's ability to engage with the activities

presented and environmental changes or family stressors evident. Conducting clinician implemented EMT intervention sessions within the child's home environment provided a platform for the clinician to address arising challenges or concerns expressed by the children's families. By observing child patterns which caused family stressors and work collaboratively with families to provide support, the EMT intervention setting could be adjusted to address any child behaviours that were of concern to the family in a timeous manner. This study contributes to literature supporting the use of home-based intervention, especially when providing services to those in LMIC such as South Africa, where the need to decentralise intervention services is crucial (Bann et al., 2016; Kasari et al., 2014; Rickards et al., 2009). Next steps for ensuring the effective, feasible and functionable implementation of EMT in South Africa is understanding the impact family stressors have on intervention, addressing cultural appropriateness of the intervention strategies and the use of play, and future involvement of parents in intervention training and implementation thereof in this context (Franz et al., 2018, Fewster et al., 2020; Schlebusch et al., 2020).

5.3 Clinical Implications

The following clinical implications based on the findings of this study are set out below:

- Implementation of an evidence-based early intervention in the home-context of a child with ASD in South Africa was described by the parents as being a viable resolution to cost implications placed on them to access early interventions for their child.
- Family routines and parent involvement in early intervention is pertinent to the successful implementation and maintenance of an intervention over time. It is imperative that clinicians implementing interventions involve parents of children with ASD in the intervention process and develop sound relationships with them to ensure they are supported and remain committed to their child's intervention.
- NDBIs support the child with ASD's development through the use of inexpensive, easily accessible toys and the child's daily routines to target skills. Though access to toys is not always possible in LMIC, such as South Africa, NDBIs continue to be feasible as they can make use of a child's naturalistic routines to target areas of development.

- In South Africa, due to poor policy implementation at state level, a significant gap in service provision for children and their families with ASD exists in the public sector. In order to implement effective and sustainable early interventions for children with ASD, discussions with clinicians and service providers working at various levels of state needs to occur. This should include decision making around whether evidence-based early interventions can be integrated into existing service delivery models, or whether new service delivery systems need to be developed that can possibly run parallel to the current systems.
- Key decisions around the implementation of evidence-based early interventions for children with ASD should incorporate discussions with policy makers, managerial staff at public health, education and social institutions, and clinicians in both public and private sectors.

5.4 Study Strengths and Limitations

5.4.1 Strengths of the Study

The following considerations can be viewed as strengths of the study:

- There is limited published data on the use of NDBIs in South Africa and, in particular, the use thereof to address early intervention provision for children with ASD. This study added to the body of research literature by investigating the implementation of a NDBI in the home environment of children with ASD.
- The EMT intervention demonstrated a positive effect on the NDWs used by all children in the study when implemented in their home environment within the Western Cape of South Africa, with relatively few intervention sessions with a low dosage (20 minutes per session, with a total time between 8 to 10 hours). Previous research focused on implementation of EMT in a clinical context (Hampton et al., 2019) while this study expanded on the findings to include a child's natural learning context, their home.
- Materials used in the implementation of the EMT interventions included a variety of toys that were easily accessible and inexpensive, and toys were gifted to the families at the end of the intervention.
- All 3 children in the study generalised gains in their language skills to use with their parents following the completion of the EMT intervention. Previous research EMT research conducted in South Africa had not included measures to address generalisation of children's language skills to other communication partners, such as their parents, and this research therefore expanded on

further positive findings as a result of EMT intervention. This further provided parents with feelings of relief and reduced potential family stressors due to challenges in providing their child with intervention and witnessing progress in their language development.

- The trained SLT (clinician) was able to deliver the intervention consistently at high levels of fidelity. This demonstrated the applicability of EMT in South Africa when implemented in a child with ASD's home context, further supporting the decentralisation of this evidence-based intervention to use in different contexts in a LMIC.

5.4.2 Limitations of the Study

Although this study demonstrated the effectiveness of EMT intervention on a child with ASD's spoken language abilities when used in the home environment of families living in the Western Cape of South Africa, limitations of the study must be considered in the interpretations of these results. The study limitations are presented below:

- The intervention procedures were implemented within the home environment of children with ASD living in South Africa using play as the primary context. Play is not considered to be the most used method of parent-child interactions in many homes of children with ASD in South Africa which is directly related to high poverty rates and limited access to toys (Lehohla, 2017). It is therefore important to consider the use of routine-based interactions as a context for EMT interventions, for some families.
- Despite the study's positive effect on children with ASD's language abilities, a significant cost implication on the clinician was evident to implement the intervention with the children's home environment. This includes the travel time and expense incurred by the clinician travelling to and from the children's home on a regular basis, which places a question on the long-term sustainability of clinician implemented interventions within the home environment of children and their families with ASD.
- Though gains in child's language use was maintained to use when interacting with their parents after the completion of the EMT intervention, other more robust measures of generalization (embedded within the single subject design) would have increased the research efficacy and feasibility of the intervention
- The small participant sample size could lead to results not being generalised. across larger populations (Kratochwill et al., 2013; Vance & Clegg, 2012). The

current study included 3 participants and were not a clear representation of the South African population, and only included male participants.

- Noticeable variability in the stability of the data trends was evident across children. Implementing the EMT intervention within the home environments of the 3 children, while feasible, presented challenges. Family stressors and dynamics at times resulted in a child being dysregulated. Changes in routine or demands not being met in the home further contributed to challenging behaviours being displayed by a child. For example, it was difficult to establish regular and consistent sessions with Tariq due to sudden changes in his environmental contexts. With Madison, changes in routine contributed to periods of him being less communicative than others.
- Only a percentage of the baseline and intervention sessions were transcribed and coded by the independent coder. The remaining data sessions were transcribed and coded by the clinician to ensure the transcripts were corrected coded using the prescribed EMT coding system.

5.5 Future Research

- Consideration into family stressors that impact the ability to implement the EMT intervention were not directly addressed during the study. By understanding the confounding effects of having a child with ASD and the lack of access to resources and support has on families living in South Africa, will provide better considerations into the adaptations of the intervention to suit this specific context. To provide effective and suitable evident-based early intervention practices within a community-based early intervention context, Guralnick (2011) proposed the *Developmental Systems Approach* which serves as a framework for considerations. This contributes to the establishment of effective intervention for children with ASD and their families in the South African context.
- The study focused specifically on English speaking children and their families only. South Africa has 11 official languages and therefore this study did not represent children and their families of other languages besides English. Languages are known to be linked to different cultures, and different cultures represent different views and value sets (Goduka, 1998). Further considerations into EMT implementation to address the different language and cultural diversities within South Africa are needed. This too should address cultural adaptations to address the use of toys in play during the EMT

intervention as in South Africa, many families do not readily have access to toys or use play as a means to engage with their child. Using everyday routines may be an alternative to play when implementing EMT.

- This study highlighted the feasible and functional implementation of EMT by a trained clinician within the home context of children with ASD and their families living in South Africa. EMT has successfully been implemented in developed countries by parents independently and through an established model of parent training led by a clinician (Teach-Model-Coach-Review) (Roberts & Kaiser, 2015) and have additionally demonstrated success during a short duration, parent-implemented, home-based study with families of low-socioeconomic status (Hatcher & Page, 2020). De Vries (2016) noted that in Africa, it is highly unlikely that a sufficient number of trained therapists will be available to provide services to children with ASD, and that parents or carers should be considered in terms of upskilling. The use of EMT with parents should therefore be investigated and would contribute towards the development of linguistically and culturally relevant interventions in the South African context and move towards reducing family stressors related to lack of available support and intervention services.
- More policy driven research is therefore needed in South Africa to better understand and facilitate if / how evidence-based early interventions can be provided to the majority of the population through public services.

5.6 Conclusion

This study has further contributed to the literature regarding effective, feasible and functional implementation of a NDBI within South Africa, a LMIC with known resource limitations. Following on from the initial replication of EMT in Africa (Hampton et al., 2019), this study provides an important development in the adaptation and implementation of this intervention within different contexts in South Africa. This study has demonstrated that EMT may be an intervention approach that could be effective for use within the home contexts of some children with ASD in South Africa, though numerous environmental, contextual and, child and family-centred considerations need to be made. Of particular note is for professionals to be more aware of the potential family stressors that contribute to the successful and sustained implementation of the intervention. Further research is therefore required to continue adaptations to EMT to consider individual family and child needs, the various cultural beliefs, linguistic diversity and family stressors, in order to

implement the intervention with different people and across contexts. The use of EMT in this study demonstrated growth in a child's vocabulary skills and spontaneous language use over a relatively short period of time, as well as the children's ability to maintain the gains in language following the completion of the intervention. There are limited trained Speech-Language Therapists who are able to implement the intervention within a child's home context, therefore highlighting that additional work is needed to identify alternative intervention agents who could potentially deliver services within a child's home when considering how to scale up the intervention for the SA context. The study is a first step in understanding the complexity of implementing EMT in the home context, which is necessary when we consider the possibility of training parents to implement the intervention in a child's day routines within the home context.

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APPENDIX A: Parental Consent Form



UNIVERSITY OF CAPE TOWN
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December 2017

Dear Parent/Guardian,

I am a Speech-Language Therapist completing my Master's in Speech-Language Pathology at the University of Cape Town. Your child is being invited to participate in the research project I am conducting entitled: ***"The effects of home-based enhanced milieu teaching on the spoken-language outcomes of children with autism in South Africa"***. Ethics approval from the University of Cape Town's Faculty of Health Sciences Human Research Ethics committee (UCT FHS REC.HREC) was obtained (Ethics Number). During this project, your child will receive play-based language therapy and your child's progress will be recorded. The therapy sessions will take place within the home environment and will be video recorded. The project focuses on three main aspects:

1. Assessing your child's current language and play skills, using formal tests and informal play based observations.
2. Conducting therapy with your child to stimulate their language and play skills within the home environment.
3. Assessing whether your child uses the skills they developed during the project when interacting with you, the parent.

The name of the therapy being used is Enhanced Milieu Teaching (EMT) and it was developed in America. I have been trained in the use of this therapy method by my supervisor, Dr. Michal Harty, who has been trained by the professionals who developed this therapy as well as having input from them myself.

WHY IS THE PROJECT BEING DONE?

- Children with Autism Spectrum Disorder (ASD) often have difficulty learning and using language and this makes it difficult to communicate their everyday needs.
- Children with ASD need help to learn how to communicate using words and sentences and often a speech-language therapist works with them.
- During a research project that took place in 2016, a speech-language therapist found that children with ASD in South Africa learnt and used new words and sentences when the play-based therapy approach, EMT, was used with the children at school.
- We now want to see if children can learn new words and sentences when we use EMT therapy with them in their homes.
- We then also want to see if they can use those new words and sentences when playing with you.

- I have been trained in the use of EMT and will have people checking that I am doing the therapy properly during the project.

HOW LONG WILL THE PROJECT LAST?

- The project will take place during a 4-month period.
- We plan to work with your child 2 times a week, for 30 minutes at a time.
- We will work with your child in their home on a day and time that is suitable for them and you.

WHY IS MY CHILD BEING ASKED TO TAKE PART?

- Your child is being asked to take part in this research project because we think your child can benefit from the therapy.
- We want to determine if this therapy can be used in the home environment to help young children with ASD living in South Africa.
- We then want to determine whether they use what they have learnt in therapy when they communicate to you.

HOW MANY PEOPLE WILL TAKE PART IN THIS PROJECT?

- We will work with 3 children from the preschool classes at your child's school.

WHAT HAPPENS DURING EMT THERAPY?

- EMT is a play-based therapy in which children choose to play with certain toys over a period of 30 minutes.
- The child chooses the toys and also decides how long they want to play with one toy set before moving on to the next one.
- The therapist plays with the child using the toys that the child has chosen.
- The therapist acknowledges all the child's attempts to communicate (using words or gestures or manual signs) while they are playing.
- The therapist responds to the child's communication attempts and models new words and phrases the child could say while playing.
- The child responds to the words and phrases modelled by the therapist by using the language they already have or by trying to use the new language they have just heard.
- The therapist aims to create lots of opportunities for the child to practice and to use the new words and phrases while playing with the toys.

WHAT WILL HAPPEN DURING THE PROJECT?

- Your child will receive EMT therapy 2 times a week in a room within their home.
- We will assess your child's language and play skills before therapy and after therapy in a room within the school to measure the effects of the therapy.
- We will assess your child's language skills when playing with you before and after therapy to measure whether what they have learnt during therapy is used when interacting with you.
- The sessions will be video recorded so that we can transcribe (write down) what your child says during the sessions.
- The video sessions as well as the transcriptions will be safely stored.
- The only people who will be able to watch the recordings will be members of the research team.
- The video recording will be destroyed once all the data has been analysed and the results of the study are determined.

WHAT WILL HAPPEN WHEN THE PROJECT IS OVER?

- We will share the main findings of the project with you. We will give you a report about the progress that your child made during therapy.
- The staff at the school will also be told about the results of the study.
- The information gathered will be analysed and compiled into a report.
- The information will be shared with other professionals by describing the results in an article.
- If the project is successful, we may be able to research whether parents can be trained to use this therapy with their child.

ARE THERE ANY BENEFITS FOR PARTICIPATING?

- Working with your child will help us to understand if this type of therapy can improve the language skills of children with an Autism Spectrum Disorder (ASD) when being implemented in the home environment.
- It will further help us to understand whether children with ASD use what they have learnt during this type of therapy with other people, such as their parents.
- The toys that your child will be using during the therapy will be yours to keep at the end of the project.
- If the therapy is successful, we may be able to research whether parents can be trained to use this therapy with their child.

ARE THERE ANY RISKS FOR PARTICIPATING?

- There are no risks towards your child if he/she is allowed or is not allowed to participate in the project.
- You will not be charged for the therapy, or for any of the materials (toys) used during therapy.

WHAT IS MY CHILD'S RIGHTS AS A PARTICIPANT?

- You have the right to change your mind at any time about your child's being part of the project.
- You can withdraw your child from the study at any time. You do not need to tell the therapist who is working with your child why you have changed your mind.
- Your child will not be treated any differently if you decide not to allow them to take part.

CONFIDENTIALITY OF PARTICIPANTS

- We will not share any of your personal details.
- No names, surnames, addresses or telephone numbers will be stored on the written transcripts of the therapy sessions.
- No names, surnames, addresses or telephone numbers will be shared in the final report, article or conference presentations.
- Your child's face may be visible on the video recording. But the only people who will see the videos will be members of the research team.
- Once the data analysis for the project is completed the video recordings will be destroyed.

You can choose if you want your child to be included in this project. If you do not want your child to take part in this project, then he/she will not be assessed or included for the therapy sessions. You need to fill in the form on the next page to tell us what you have decided to do.

If you have any questions about the project, you can call me (Caroline Theron) at work on 021 685 0483 or email me at thrcar005@myuct.ac.za, or my research supervisor, Dr Michal Harty on 021 406 6313 or via email at michal.harty@uct.ac.za. You can contact the Chairperson of UCT FHS Research Ethics Committee, Prof Marc Blockman on 021 406 6338 if you have any questions regarding your rights or welfare as participants in the study.

Thank you for your time and cooperation.

Caroline Theron
Masters student

Dr Michal Harty
Research Supervisor



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Division of Communication Sciences and Disorders



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INFORMED CONSENT FORM:

Title of the project: *The effects of home-based enhanced milieu teaching on the spoken-language outcomes of children with autism in South Africa.*

After reading the information sheet provided:

1. I understand what is expected of my child during this project.
2. I understand that therapy sessions will take place in my child's home.
3. I understand that if my child participates in the project the sessions with my child will be video recorded to capture my child's spoken and gestural communication attempts.
4. I am aware that the information obtained in this study will be viewed by the members of the research team.
5. I understand that information about my child will be safely stored during the project.
6. I understand that I may take my child out of the project at any time. My child will not be treated any differently because of my choice.

After reading this I,

_____ ,

parent / guardian of _____
(child's full name)

- ☐ want my child
- ☐ do not want my child

to take part in this research project.

Please sign below:

Parent / Guardian

Date

If participant cannot read for any reason please complete this section:

I have witnessed the correct reading of the consent form to the participant; they have had opportunity to ask any questions about the study and have full understanding. I confirm that they have given consent voluntarily.

Signature of witness: _____

Thumb print of participant

Date: _____



APPENDIX B: Video Consent



UNIVERSITY OF CAPE TOWN
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Division of Communication Sciences and Disorders



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December 2017

Dear Parent/Guardian,

Thank you for granting permission for your child to participate in our study entitled: ***“The effects of home-based enhanced milieu teaching on the spoken-language outcomes of children with autism in South Africa”***. Ethics approval from the University of Cape Town’s Faculty of Health Sciences Human Research Ethics committee (UCT FHS REC.HREC) was obtained (Ethics Number). As part of the study we will need to video record your child and yourself playing together before they start with therapy and when the therapy sessions are finished (2 sessions). We want to see what language and gestures your child uses when interacting with you before they start with therapy and then after so that we can determine whether what they have learnt during the therapy is being used when interacting with you. The sessions will be 30-minutes long and take place in your home. You will be given a play kit with toys for you to use during the sessions. The sessions will be video recorded so that we can transcribe (write down) what your child says during the sessions. The video sessions as well as the transcriptions will be safely stored and only people who are members of the research team will be able to watch the recordings. The video recording will be destroyed once all the data has been analysed and the results of the study are determined.

We will not share any of your personal details and no names, surnames, addresses or telephone numbers will be stored on the written transcripts of the sessions. Your face may be visible on the video recording and the only people who will see the videos will be members of the research team. At the end of the study you will receive feedback regarding the results of the study.

You need to fill in the form on the next page to tell us whether you do or do not give permission to be video recorded.

If you have any questions about the project, you can call me (Caroline Theron) at work on 021 685 0483 or email me at thrcar005@myuct.ac.za, or my research supervisor, Dr Michal Harty on 021 406 6313 or via email at michal.harty@uct.ac.za.

Thank you for your time and cooperation.

Caroline Theron
Masters student

Dr Michal Harty
Research Supervisor



UNIVERSITY OF CAPE TOWN
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VIDEO CONSENT FORM:

Title of the project: *The effects of home-based enhanced milieu teaching on the spoken-language outcomes of children with autism in South Africa.*

After reading the information sheet provided:

7. I understand that myself and my child will be video recorded during two play sessions.
8. I understand that the video recording will be used to capture my child's spoken and gestural communication when interacting with me.
9. I am aware that the information obtained in this study will be viewed by the members of the research team.
10. I understand that information about my child and myself will be safely stored during the project.

After reading this I,

_____ ,

parent / guardian of _____
(child's full name)

- ☐ give permission
- ☐ do not give permission

to be video recorded.

Please sign below:

Parent / Guardian

Date

If participant cannot read for any reason please complete this section:

I have witnessed the correct reading of the consent form to the participant; they have had opportunity to ask any questions about the study and have full understanding. I confirm that they have given consent voluntarily.

Signature of witness: _____

Thumb print of participant

Date: _____



APPENDIX C: HREC Ethical Approval



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



Room E53-46 Old Main Building
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Observatory 7925
Telephone [021] 406 6492
Email: sumayah.arietdien@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

03 September 2018

HREC REF:433/2018

Dr M Harty
Department of Health & Rehab
F56, Room 23
OMB

Dear Dr Harty

PROJECT TITLE: THE EFFECTS OF HOME-BASED ENHANCED MILIEU TEACHING ON THE SPOKEN-LANGUAGE OUTCOMES OF CHILDREN WITH AUTISM IN SOUTH AFRICA (SUB-STUDY LINKED TO 545/2015) master's Candidate - Ms c Theron

Thank you for your response letter dated 27 August 2018, addressing the Issues raised by the Human Research Ethics Committee (HREC)

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 September 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

We acknowledge that the student: Ms Caroline Theron will also be involved in this study.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal Investigator.

Please note that for all studies approved by the HREC, the principal Investigator **must** obtain appropriate Institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

APPENDIX D: WCED Research Approval



Directorate: Research

Audrey.wyngaard@westerncape.gov.za

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Fax: 0865902282

Private Bag x9114, Cape Town, 8000

wced.wcape.gov.za

REFERENCE: 20190509-4491

ENQUIRIES: Dr A T Wyngaard

Ms Caroline Theron
E32 Edingight
6 Queen Road
Rondebosch
7700

Dear Ms Caroline Theron

RESEARCH PROPOSAL: THE EFFECTS OF HOME-BASED ENHANCED MILIEU TEACHING ON THE SPOKEN-LANGUAGE OUTCOMES OF CHILDREN WITH AUTISM IN SOUTH AFRICA

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **01 June 2019 till 31 May 2020**.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services
Western Cape Education Department
Private Bag X9114
CAPE TOWN
8000**

We wish you success in your research.

Kind regards.

Signed: Dr Audrey T Wyngaard

Directorate: Research

DATE: 10 May 2019

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Safe Schools: 0800 45 46 47

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APPENDIX E: School Consent Form



UNIVERSITY OF CAPE TOWN
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July 2018

Dear Principal and Chairperson of the School Governing Body

“The effects of home-based enhanced milieu teaching on the spoken-language outcomes of children with autism in South Africa”.

I am a Masters in Speech-Language Pathology student at the University of Cape Town. I would like to request permission to conduct a research study with certain learners at Alpha School. Ethics approval from the University of Cape Town’s Faculty of Health Sciences Human Research Ethics committee (UCT FHS REC.HREC) was obtained (Ethics Number). The purpose of this study is to investigate whether a naturalistic play-based language intervention called Enhanced Milieu Teaching (EMT) can be implemented within the home environment of a young child with Autism Spectrum Disorder (ASD) to improve their language skills. I further want to investigate whether the potential improvements in the young child with ASD’s language skills following the EMT intervention are generalised to use with their parents.

EMT research was conducted in 2016 by a team which included my research supervisor, Dr, Michal Harty, at Alpha School with 3 young children with ASD who were attending the school and the results showed that EMT is an effective intervention for use in the South African context. We therefore wish to extend on that research in order to find out the generalisation effect of EMT to use with parents and then later for the potential to study whether EMT can be trained to parents of children with ASD in South Africa.

Potential candidates for participation in the study from Alpha School need to be between the ages of 4 to 7 years, have received a diagnosis of ASD using the module 1 activities and materials from the Autism Observation Diagnostic Schedule (ADOS), and have a minimum of 1 to 10 spoken words. We will assess the child’s language and play skills before and after the EMT intervention to measure the effects thereof. Assessment sessions will take place at the school in a quiet room. Intervention sessions will take place within the child’s home. We wish to provide intervention to 3 children from the school who meet the inclusion criteria of the study. Each child will receive 30 minutes of intervention for approximately 20 sessions. The toys and materials will be provided by the research team. The assessment and intervention sessions will be video recorded so that we can transcribe the interaction between the child and therapist. The video sessions, as well as the transcriptions, will be stored on a secure access online repository. Secure login details will only be provided to members of the research team. The transcriptions will be de-identified and once the video recordings have been transcribed and coded they will be removed from the online repository and stored on a computer that only the primary researcher can log into. No names, surnames, addresses or telephone numbers of participants will be shared in the final report, article or conference presentations.

If you have any questions about the project, you can call me (Caroline Theron) on 021 685 0483 or email me at thrcar005@myuct.ac.za. Your participation will be greatly appreciated.

Kind Regards,

Caroline Theron
Primary research

APPENDIX F: Example of Transcript and Coding

Transcription Details:

\$ Adult, Child

+Name: Participant

+Diagnosis: Autism Spectrum Disorder

+Gender: Male

+Date:

+Session number:

+Session type: Intervention

+Adult:

-03:00

A {connects bridge to track} on [et][ym][at].

C {opens bag} [t].

A {opens bag} open [mt][ym][at].

C {toys out} [t].

A out {toys out} [mt][ym][at].

C **out** [i][w].

A out [mt][ym][at].

C {picks up tree} [t].

A tree {points to tree} [mt][ym][at].

C {puts sign down} [t].

A on {puts sign down} [mt][ym][at].

C **on** [i][w].

A [n].

-04:00

C {obstacle on road} [t].

A {obstacle on road} on [mt][ym][at].

C **on** [i][w].

A on road [mt][yx][at].

C {picks up tree} [t].

A tree {points to tree} [mt][ym][at].

C [n].

A {puts toy down} down [ut][ym][at].

C {attempts to put bridge together} [t].

A {puts bridge together} fix [ut][ym][at].

C **fix** [i][w].

A fix [mt][ym][at].

C {picks up bridge} {vocalisation} [t][v].

A {puts bridge together} fix [ut][ym][at].

C XX [cx].

A HM [mt][be].

C {sets up bridge} [t].

A [n].

APPENDIX G: EMT Coding System

General coding rules:

1. All codes come before the period.
Example: c cook food [u].
2. There must be a space in between the last word and the first [.
3. You do not need to capitalize the coded letters; [u] OR [U] is acceptable.
4. There should be one code from each category depending on the utterance (Independence, Form). Generally if you are using a Single Code, it will be the only code at the end of the line. See detailed descriptions for further instructions.

Example:

c my dog [u][w].

Code Summary: Child

<i>Single Codes</i>	<i>Independence</i>	<i>Form</i>
[cx] –unintelligible	[u] – unprompted	[g] – gesture
[s] – scripted	[p] – prompted	[w] - word
[n] – no response / no opportunity to respond	[i] – imitated	[t] – action /play
	[e] – elicited	[ve] – vocalization with eye contact
		[v] - vocalisation

Single Codes: These codes are either the only codes to appear on a line or added at the end of other codes when appropriate.

1. **Child Unintelligible [CX]:** Child is completely unintelligible [CX]; the child is saying a word and NOT vocalizing, that one cannot understand. This code is only used if the entire utterance is unintelligible.

Example:

c x [cx].

c x playdoh [u].

Note: This code is only used if you are sure the child is intentionally trying to communicate (i.e., not vocalizing or stimming) but the words are not clear enough to be understood.

This code can be used along with the independence code only **IF** the child also gestures in the utterance.

Example:

c {grabs} xxx [cx][u][g].

2. **Scripted Self Talk [S]:** the child is using rote speech that is not functionally communicative. An instance of noncontextual or nonfunctional speech, including babbling, humming, singing, repetitive noises, or phrases from movies/tv/songs that are unrelated to the present situation. Scripted episodes usually last more than 2 seconds and are often accompanied by stereotypy (peering, flapping, jumping, etc). The child is usually saying the script to himself/herself (not social, not communicative). Scripts are repetitive (chain, succession, same time or with same materials during “play” or routine), often have a pattern of sound or noise (ahAHah ahAHah ahAHah), and can be difficult to interrupt or unaffected by adult speech or actions. Pronoun reversal and incorrect labeling are also common.

Examples:

c bobthebuilder [s].

– child is speaking rotely and out of context

c (you’re ok you’re ok) you’re ok [s].

– child is meaning that he/she is ok and saying it for the purpose of self-soothing

c {grabs} happybirthday [s].

– the child means “I want this” and is using “happy birthday” inappropriately

3. **No Repose / no opportunity to respond [N]** – The child provides no verbal or gestural response to the adult’s communication engagement or play interaction.
Or the child is not provided an opportunity to respond as the adult took an extra turn during the play or communication interaction.

Independence: The level of support needed by the child to communicate.

1. **Unprompted [U]:** non-prompted, non-imitated, non-elicited communication. This is spontaneous child language. If the child uses part or all of the adult’s previous communication, but changes the mode of communication (i.e., adult speaks and child presses the adult’s word on the AAC), it is considered [u]. If the child adds words to the adult’s previous communication then it is considered [u].

Example:

a roll the ball.

c {presses ‘ball’ on aac} [u][a]. ←here the child changed the mode of communication from verbal to AAC

If the child repeats what the adult says but it happens more than 3 seconds after the adult speaks, it is considered [u].

Examples:

a hammer.

c nail [u].

2. **Prompted [P]**: the child is communicating in response to a Say or Choice prompt OR repeating words from the previous adult utterance in response to a question. The child must be saying the prompted words OR only saying repeated words (no original words). If the child says something unrelated in response to a Say or Choice prompt, code [e].

Examples:

a say dog.

c dog [p].

a red truck or blue truck?

c red truck [p].

a what color is it?

c color [p].

3. **Imitated [I]**: the child imitates all or part of the preceding adult communicative act (words, AAC, gesture) but does not add anything to it. If the child adds words or changes the mode then it is [u]. The child must imitate the utterance within 3 seconds to be considered [i]. If the child repeats any or all of the previous adult utterance but it occurs *after* 3 seconds, it is considered [u]. If on the line of 3 seconds, code [i].

Examples:

a dog.

c dog [i].

a {signs dog}.

c {signs dog} [i].

a we have red and blue playdoh.

c have red playdoh [i]. ←here the child repeats *part* of the adult's utterance but does not add anything new or change the mode of communication.

a dog.

c big dog [u]. ←here the child adds new words

a dog.

c {signs dog} [u]. ←here the child changes the mode of communication

4. **Elicited [E]**: the child is using spontaneous language in response to an adult communication open prompt or cue. Child utterances in response to any of the following will receive this code:
- Open Question (ME Prompt – “what do you want?”)
 - Yes/No Question (“do you want the ball?”)
 - Clarifying question (“huh?”)
 - Test Question (“what is this?”)
 - Time Delay

Time Delay: A time delay is a nonverbal way of prompting the child to request an object, action or assistance. A Time Delay occurs when an adult uses an expectant look while

holding a toy out of reach, waiting to perform an action the child wants (i.e., not opening a box or not winding a toy while looking expectantly at child), or sabotaging a child's routine (i.e. stopping cars from going down the track, putting hand over ball chute, looking at child expectantly or oriented toward the child and waiting for a child to respond).

- A time delay should be overt
- A time delay must begin with the adult having the child's attention

The following are considered time delay strategies:

- a. Assistance: creating a situation in which the child needs the adult's help
Examples: Bottles, bags, jars, etc. that the child cannot open; toys the child cannot assemble alone; wind-up toys the child cannot operate
- b. Inadequate portions: providing a small amount of a desired material
Examples: Pouring a small amount of water into a tub; putting only a small ball of playdoh on the table; squirting only a tiny amount of paint in the dish
- c. Choice Making: the adult holds up two options and waits from the child to communicate (this should be done without any words).
- d. Waiting with routine: the adult sets up a routine modeling the target, and then waits to see if the child produces the target.
Example: The adult and child pour beans together and the adult says "pour" after each time they pour the beans. The 3rd time, the adult holds the beans up and but does not pour the beans and looks at the child expectantly until he communicates/requests.
- e. Waiting with cue: the adult sets up the environment so that the objects cue the child.
Example: The adult holds the shoe up to the baby's foot and looks at the child expectantly until he communicates/requests.

Examples:

- a {holds up two objects}.
c {grabs} [e].

- a tell me what you want.
c playdoh [e].

NOTE: Adult {points} are also considered communicative cues when they are pointing for the purpose of gaining the child's attention. If the child's utterance is in response to the adult silently pointing something out to them (as in pointing to a picture in a book during the "dog book" portion of the Language Sample), code [e].

Form: how the child is communicating.

1. **Gesture [G]:** child makes a gesture alone (a signal that does not refer to a specific action or object). If the child uses words and gestures, code as words [w]. Gestures include reaches, grabs, shaking of the head, head nodding, points, shows, and gives.

Examples:

c {child reaches} [g].

c {child points to apple} [g].

2. **Words [W]:** child says a word. A word does not have to be clearly articulated. If the child uses the same sounds for the same object consistently, it is considered a word. If the child uses the device and speaks simultaneously, code as words. If the child uses the AAC device and then speaks, code as AAC. If the child says the words and then pushes the same words on the AAC device, code as words.

Examples:

c ball [w].

c {child says ba for “ball”} ball [w].

c {says ‘blocks’ first and then presses ‘blocks’ on aac} block/s [w].

3. **Action / Play [T]:** The child engages using an action or playing with a toy or responds to the adult by imitating an action or the adult’s play

Example:

C {cut} [t].

A {cut} cut [mt][ym][at].

4. **Vocalization with Eye Contact [VE]:** The child vocalizes with communicative intent while CLEARLY making eye contact with the adult. Must be more than just a fleeting glance.

Example:

c {vocalization + eye contact} [ve].

5. **Vocalization (only) [V]:** The child vocalizes with communicative intent but does not look at the adult or makes fleeting eye contact with the adult.

Example:

a tell me what you want

c {reaches} {vocalization} [v].

Code Summary: Adult

<i>Responsiveness</i>	<i>Teaching Strategy</i>	<i>Target Level</i>
[mt] – matched turn	[yx] – expansion	[at] – at target
[ut] – unmatched turn	[yt] – time delay	[ab] – above target
[et] – extra turn	[yp] – prompt	[ax] – unintelligible

	[ym] – model (play/verbal)	[n] – no response / no opportunity to respond
		[be] – below target

Responsiveness: how the responsive is the adult to the child's communication or play.

1. **Matched turn [MT]:** the adult takes turns appropriately matching that of the child's during communication and play. This can include pausing to allow for the child to respond, responding within 2 seconds to all child communication attempts, and the adults maintains appropriate pacing of language models.

Examples:

C {drives cars} [t].
A {drives cars} go [mt][ym][at].
C {drives cars} [t].
A {drives cars} go [mt][ym][at].

2. **Unmatched turn [UT]:** the adult DOES NOT appropriately match the child's communication attempts and does not allow for the child to respond before modelling language.

Examples:

C {drives cars} [t].
A {car on} on [ut][ym][at].
C {drives cars} [t].

3. **Extra turn [ET]:** the adult DOES NOT match the child's communication attempt and uses an extra turn when the child has remained silent during play or attempted communication exchanges. An extra turn is used to introduce a new idea to play if the child is unable to expand on their play acts.

Examples:

C {puts obstacle on track} {stereotypical vocalisation} [i][t][s].
A {points to cars} stop [et][ym][at].

Teaching strategies: the level of support the adult uses to facilitate communication from the child

1. **Expansion [YX]:** adding more gesture or words to the child's communication. This use used to immediately connect the child's communication to additional new communication and to increase the complexity of the child's communication and language skills

Example:

C drive {pushes car} [u][w][t].
A drive the car {pushes car} [mt][yx][at]

If the child repeats what the adult says but it happens more than 3 seconds after the adult speaks, it is considered [u].

Examples:

a hammer.

c nail [u].

2. Time Delay [YT]: A time delay is a nonverbal way of prompting the child to request an object, action or assistance. A Time Delay occurs when an adult uses an expectant look while holding a toy out of reach, waiting to perform an action the child wants (i.e., not opening a box or not winding a toy while looking expectantly at child), or sabotaging a child's routine (i.e. stopping cars from going down the track, putting hand over ball chute, looking at child expectantly or oriented toward the child and waiting for a child to respond).

- A time delay should be overt
- A time delay must begin with the adult having the child's attention

Examples:

a {holds up two objects} [yt].

c {grabs} [e].

3. Prompt [P]: Using an Open, Say or Choice prompt to elicit a response from the child.

Examples:

a tell me what you want [yt].

c playdoh [e].

a say dog.

c dog [p].

a red truck or blue truck?

c red truck [p].

a what color is it?

c color [p].

4. Modelling [YM]: The adult model's their communication or play / actions in response to the child, at the child's level. The adult must match the child's language targets.

Examples:

C car {shows} [u][w].

A car {points} [mt][ym][at].

Target level: the level of at which the adult uses language compared to the child's communication.

1. **At target [AT]:** the adult uses words or play that is at the level or just above that of the child's.

Examples:

C go {pushes car} [u][w][t].

A go {pushes car} [mt][ym][at].

2. **Above target [AB]:** the adult uses words or play that is too high above the level of the child's communication.

Examples:

C {pushes car} [u][t].

A go over there car {pushes car} [mt][ym][ab].

3. **Unintelligible:** the adult's language was not clearly understandable.

Examples:

C jump [u][w].

A XXX down [mt][ax].

4. **No response / no opportunity:** the adult was unable to respond to the child's communication timeously as the child did not take a turn.

Examples:

C go down [u][w].

A [n].

C go down [u][w].

5. **Below target:** the adult does not appropriate respond to the child's communication and models language that is below the child's level

Examples:

C put on hat [u][w].

A HHM [mt][be].

APPENDIX H: Procedural Fidelity

Child ID:	Rater:	
Therapist:	Date:	
Session number:	Date rated:	
Environment		
Item	Coding	Rating
1. The adult sits across from and within arm's reach of the child and stays at the child's level (within the child's line of sight) during play interactions (excluding transitions between toys and behavior management instances) for the majority of the session.	1=yes, 0=no	
2. Adult removes distractions and unused materials.	1=yes, 0=no	
3. Sets out developmentally appropriate/motivating toys (i.e. at the child's play level).	1=yes, 0=no	
4. Offers a selection of toys.	1=yes, 0=no	
5. Removes distracting/perseverative items.	1=yes, 0=no	
Number of Items excluded		0
Points possible		5
Score obtained		0
Play routines		
1. The majority of steps in the play routines are at the child's play level.	1=yes, 0=no	
2. All Imitated/mirrored play acts are in the child's attentional focus.	1=yes, 0=no	
3. The adult paces their play models such that they imitate more often than they model.	1=yes, 0=no	
4. Additional toys/materials are moved into the child's attentional focus to promote spontaneous initiations .	1=yes, 0=no	
5. The adult will hand materials if a child hasn't initiated play.	1=yes, 0=no	
Number of Items excluded		0
Points possible		5
Score obtained		0

Responsive Interactions			
1. The adult pauses (>3s) after the majority of their utterances to give the child time to reply or take a turn.	1=yes, 0=no		
2. Adult responds, within 2 seconds, to all child communicative attempts (voc, gesture, sign, approximation, word, aac, joint attention) with a related response.	2= >80%, 1= >70 %, 0=< 70%		
3. The adult maintains appropriate pacing of language models throughout play, less than 4 instances of a silence for 20 seconds or more.	1=yes, 0=no		
4. The adult only mirrors and maps language onto play acts that are functional and appropriate for the majority of the session.	1=yes, 0=no		
5. Coping with moments of dysregulation. If the child engages in problem behavior, the adult responds in a developmentally appropriate manner (providing minimal attention, redirecting, using few simple behavior directions as necessary, and providing visual supports as needed [ie. timer, schedule]).	1=yes, 0=no		
Number of Items excluded		0	
Points possible		6	
Score obtained		0	
Modeling			
1. Adult models language at the child's target level (1 out of 2 adult utterances are at the child's target level).	1=yes, 0=no		
2. The adult models diverse language and avoids using same language models repeatedly. (about 20 for 1-word kid, 50 for 2-word kid).	1=yes, 0=no		
3. Adult appropriately expands child communication. (2 out of 5 child utterances are expanded by the adult).	1=yes, 0=no		

4. Adult models language that is salient and related to the child (paired with JA, play model, or shared eye contact).	2= >80%, 1= >70 %, 0=< 70%		
5. The adult models JA skills (point, show, give) frequently (pacing should be approximately 1-2 models per minute)	1=yes, 0=no		
Number of Items excluded		0	
Points possible		6	
Score obtained		0	
Milieu Teaching			
If there are no Time Delay Strategy's (TDs), the formula will indicate "coder scores". If it is before session 6, you may score na. If it is after session 6, score 0			
1. Adult uses 1-3 well-timed TDs in 10 minutes coded time (including child loses episodes).	2= 1-3, 1= >3, 0=0		
2. Time delays are high quality. Of the total number executed, what percentage were a score of 2 or greater? If no Time delays occurred, score this as NA. If child loses interest in all TDs, score this as 0.	2= >80%, 1= >70 %, 0=< 70%		
3. Adult prompts 1-3 well-timed milieu episodes in a 10 minute session (a balance between TD and Milieu, quality of engagement, and behavior issues can impact this score).	2= 1-3, 1= >3, 0=0		
4. Milieu prompting episodes are high quality. Of the total number executed, what percentage were a score of 2 or greater? If no prompting episodes occurred, score this as NA.	2= >80%, 1= >70 %, 0=< 70%		
Number of Items excluded		0	
Points possible		8	
Score obtained		0	
Total Score			
Section	Points Earned	Possible Points	Total Percentage
Environment	0	5	0,00%
Play routines	0	5	0,00%
Responsive Interactions	0	6	0,00%
Modeling	0	6	0,00%
Milieu Teaching	0	8	0,00%
Overall EMT fidelity	0	30	0,00%