UNIVERSITEIT VAN PRETORIA
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Feeding and developmental outcomes of infants in an underserved community

Bronwyn Eales

A dissertation submitted in fulfilment of the requirements for the degree

MA Speech-Language Pathology in the

DEPARTMENT OF SPEECH-LANGUAGE PATHOLOGY AND AUDIOLOGY

FACULTY OF HUMANITIES

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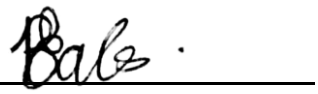

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"*Get over your hill and see what you find there with grace in your heart and flowers in your hair*"

- Mrs Krüger: Thank you for all your guidance and support throughout this process. Your thoughtful and constructive feedback was always appreciated. Thank you for sharing your abundant knowledge with me. It has been a privilege learning from you.
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ABSTRACT

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Initials and surname:	B. Eales
Supervisors:	Mrs E. Krüger; Dr J. van der Linde
Date:	October 2018
Title:	Feeding and developmental outcomes of infants in an underserved community

Background: There are prevalent environmental risk factors present in low- and middle-income countries, placing infants in underserved communities at an increased risk for feeding and developmental difficulties. **Aim:** The aim of the current study was to determine the relationship between feeding characteristics and general developmental outcomes in infants aged six to twelve months in an underserved South African community**. Method:** Data on 144 infants' feeding and development (mean age [SD] = 8,8 months [2,2]) from a primary health care clinic in the Gauteng province of South Africa were retrospectively analyzed. Data were collected using a background information questionnaire and the Montreal Children's Hospital – Feeding Scale, Schedule for Oral-Motor Assessment, Parent's Evaluation of Developmental Status, and Parent's Evaluation of Developmental Status – Developmental Milestones. The spearman's rho and phi-coefficient were used to determine associations between the infants' feeding characteristics and developmental outcomes. **Results:** Early introduction of cup feeding was found to be a predictor of possible expressive language and articulation difficulties. Gagging, spitting, or vomiting, pocketing, the use of force feeding, and poor sucking and chewing abilities were significantly associated with behavioural and social-emotional difficulties. Breastfeeding was found to be a protective factor for language development. **Conclusion:** The results emphasize the importance of primary preventive strategies and the early identification of risk factors in late infancy in underserved communities. Furthermore, the use of a transdisciplinary approach in early intervention services was highlighted to prevent the fragmentation of services and reduce the burden on primary health care in South Africa. **Key words:** infant feeding, infant development, low- and middle-income countries, underserved community, early intervention, South Africa

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LIST OF ABBREVIATIONS

BFHI	Baby-friendly Hospital Initiative
DSA	Developmental System's Approach
EI	Early intervention
FASD	Fetal alcohol spectrum disorder
HIV	Human immunodeficiency virus
HIV/AIDS	Human immunodeficiency virus/Acquired immune deficiency syndrome
HPCSA	Health Professions Council of South Africa
ICF-CY	International Classification of Functioning, Disability and Health – Children and Youth
LBW	Low birth weight
LMIC	Low- and middle-income countries
MCH-FS	Montreal Children's Hospital – Feeding Scale
mHealth	mobile Health
NAS	Neonatal abstinence syndrome
NICU	Neonatal intensive care unit
PEDS	Parent's Evaluation of Developmental Status
PEDS-DM	Parent's Evaluation of Developmental Status – Developmental Milestones
PHC	Primary health care
RTHB	Road to Health Booklet
SLT	Speech-language therapist
SOMA	Schedule for Oral-Motor Assessment
SSA	Sub-Saharan Africa
USA	United States of America

CHAPTER 1

INTRODUCTION

Chapter aim and outline

This chapter provides an in-depth discussion of the background and relevance of the current study by using recent literature. Feeding and developmental difficulties within low- and middle-income countries are discussed with particular attention to etiological pathways. The Developmental System's Approach is then reviewed with specific attention to the accessibility and availability of early intervention services for infants in low- and middle-income countries. Terminology used throughout the dissertation are then clarified and a chapter outline concludes the chapter.

1.1. Background

Infants from low- and middle-income countries (LMIC) such as South Africa are more adversely affected by biological and psychosocial risks than infants from high-income countries (Lu, Black, & Richter, 2016). Prevalent risk factors include poverty, violence, nutritional deficiencies, Human Immunodeficiency Virus (HIV) infections, substance abuse, and inadequate learning experiences (Lake, 2011). South Africa, a LMIC, is characterized by poverty, which is associated with family stress, child abuse or neglect, food insecurity and exposure to violence (Black et al., 2016). An estimated 25% of South Africans are living in extreme poverty and 56% are living under the poverty line (Statistics South Africa, 2017a). Extreme poverty may lead to inappropriate feeding environments, as well as the presence of hostility and disorganization, often creating a delay or impairment in typical feeding and developmental outcomes in infants (Aldridge, Dovey, Martin, & Meyer, 2010; Daelmans et al., 2016). Additionally, approximately 56% of children in LMIC are at risk of poor developmental outcomes due to the combined effect of poverty and other risk factors such as maternal depression or violence (Lu et al., 2016). Other risks such as economic disadvantage, housing status, age of the mother, and number of siblings are associated with delayed language, social, and cognitive development in infants, highlighting the importance of early intervention

(EI) for developmental delay in LMICs (Guralnick, 2013; Samuels, Slemming, & Balton, 2012; Van der Linde et al., 2016).

A significant number of children under the age of five years (43%) are at risk of not reaching their developmental potential as a result of exposure to extreme poverty (Black et al., 2016; World Bank, 2017). Sub-Saharan Africa (SSA) has the highest prevalence of children at risk of not reaching their developmental potential (66% in 2010) (Black et al., 2016). The inclusion of other risk factors such as low levels of maternal education and physical maltreatment substantially increases the risk for developmental delay (Richter et al., 2017). There is an increased awareness of this high prevalence, but little is being done during the early childhood years when the effects of risk factors are at its greatest due to the focus on other health priorities such as HIV and related conditions (Richter et al., 2017). The variability of early cognitive, language, motor, and behavioural development further creates a challenge for clinicians to diagnose developmental delay as early as possible (Anderson & Burnett, 2017).

It is known that gross motor delays, sensory processing difficulties, and organic and behavioural problems influence the development of feeding skills (Ramos et al., 2017). Once the development of these feeding skills are altered, feeding difficulties such as disruptive mealtime behaviour and food refusal, are often reported (Ramos et al., 2017). Feeding difficulties are most prevalent in children with neurological problems (up to 90%), and in children with developmental difficulties (80%) (Arvedson, 2008). It is further estimated that 20% to 50% of the typically-developing pediatric population present with feeding problems (Bryant-Waugh, Markham, Kreipe, & Walsh, 2010). The incidence of feeding difficulties in the typical population suggests that all infants may develop a feeding problem if they fail to advance in the skills needed to cope with developmental demands - such as weaning from a liquid diet to a solid diet and self-feeding (Aldridge et al., 2010). However, only a few prevalence studies on pediatric feeding difficulties in the general population are available (Iannotti et al., 2016; Motion, Northstone, & Emond, 2001; Rispoli, McGoey, Koziol, & Schreiber, 2013; Rommel, De Meyer, Feenstra, & Veereman-Wauters, 2003). This has resulted in a lack of reporting on the impacts of feeding difficulties in the general population (Bhattacharyya, 2015).

The interference of biological and environmental factors during the sensitive period of early childhood increase an infant's susceptibility to feeding and developmental difficulties (Black et al., 2016; Gleason, 2018). The early childhood years are characterised by a period of rapid brain development creating the foundation upon which skill acquisition and learning in middle childhood, adolescence, and adulthood is built on (Gleason, 2018). Infants in LMIC are exposed to multiple environmental risk factors, which impede the typical pattern of feeding and developmental progression possibly creating future learning difficulties (Black et al., 2016; Richter et al., 2017). Research indicates that building a healthy caregiver-infant interaction that is responsive and emotionally-supportive may reduce the detrimental effects of these risks and protect early brain development (Gleason, 2018; World Health Organization, United Nations Children's Fund, & World Bank Group, 2018). Benefits of a healthy caregiver-infant relationship include gains in language development, emotional regulation, attachment security, and school readiness (Britto et al., 2017; Shonkoff et al., 2012). Biological, psychosocial, and environmental factors may, however, influence the caregivers' ability to provide a stimulating and safe environment for their infant (Britto & Engle, 2015). A healthy caregiver-infant relationship may therefore act as a buffer against adversity, but a strained relationship has the potential to negatively influence feeding and developmental outcomes further (Gleason, 2018).

Ideal language development occurs within stimulating and supportive social interactions such as family mealtimes (Crapnell, Woodward, Rogers, Inder, & Pineda, 2015; Glascoe & Leew, 2010). A study in Canada reported that 48% of children (birth to six years of age) with a language impairment showed a previous history of feeding difficulties and suggested that both food transition and food selectivity may have an influence on mealtime interactions (Fabrizi, 2010; Malas et al., 2017). Language development is negatively affected as a result of the influence of these feeding difficulties on language stimulation and interaction (Fabrizi, 2010; Malas et al., 2017). Another study reported that infants with feeding difficulties, which persisted for the first 15 months of age, presented with significant impairments in their motor, language, and behavioural development (Crapnell et al., 2015; Fishbein, Benton, & Struthers, 2014; Motion et al., 2001). These findings reveal the importance of an enriching

and stimulating environment on optimal developmental outcomes (Anderson, Spencer-Smith, & Wood, 2011).

The family may also influence feeding processes through modelling and learning mechanisms (Aldridge et al., 2010). Learned feeding avoidance is a common feeding concern frequently related to aversive conditioning (e.g. persistent force feeding) and inappropriate mealtime interactions (Silverman, 2010). These early experiences may result in maladaptive behaviour that persist as learned abnormal motor patterns are difficult to unlearn (Borowitz & Borowitz, 2018). Varying complex interactions between biology, culture and previous experiences occur during development and result in risk or resilience in early childhood (Gleason, 2018).

1.2. Etiological pathways of feeding and developmental difficulties

A high prevalence of biological and established risks that may lead to feeding and developmental difficulties exists in SSA. These risk factors include preterm birth, low birth weight (LBW), Human Immunodeficiency Virus /Acquired Immune Deficiency Syndrome (HIV/AIDS), Fetal Alcohol Spectrum Disorder (FASD), and Neonatal Abstinence Syndrome (NAS) (Blencowe et al., 2012; UNAIDS, 2016; Olivier, Curfs, & Viljoen, 2016; Weich et al., 2017; WHO, 2012). Due to these etiologies, infants are at an increased risk for feeding and developmental difficulties related to neurodevelopmental, motor, or cognitive involvement, as well as possible craniofacial abnormalities and respiratory difficulties (Black et al., 2016; Borowitz & Borowitz, 2018). It is therefore evident that infants with feeding and developmental difficulties are heterogeneous in nature as multiple etiological pathways and a wide range of interactions can co-occur (Goldfield et al., 2017; WHO et al., 2018). Some of the etiologies of feeding and developmental difficulties will be discussed briefly to provide an overview of the heterogeneity of these difficulties in infants.

Infants born preterm with LBW are at risk for feeding difficulties and developmental delay (WHO, 2011). A high prevalence of 12,3% of infants in SSA are born preterm (Blencowe et al., 2012). SSA also has the highest prevalence of LBW (13%) (WHO, 2012). Preterm infants are at risk for feeding difficulties due to poor coordination and tolerance of sucking, breathing, and swallowing as well as nutritional demands influenced by infants' respiratory status, and the

neurologic sequelae associated with preterm birth (Lefton-Greif & Arvedson, 2016; Prasse & Kikano, 2009; Rybak, 2015). Both preterm birth and LBW result in neurodevelopmental outcomes commonly referred to as a combination of cognitive delays, motor delays, cerebral palsy, blindness, and hearing impairment (Pascal et al., 2018). There is evidence that infants born preterm and living in conditions of poverty endure adverse effects on cognitive development due to the additive nature of these factors (Beauregard, Drews-Botsch, Sales, Flanders, & Kramer, 2018). Additionally, this population is often at a disadvantage as caregivers are not confident in providing nurturing care, which is supportive and stimulating (WHO et al., 2018). A study demonstrating these effects found that infants born very preterm and with a very LBW presented with deficits in their overall language, receptive language, expressive language, phonological awareness and grammar abilities by early school age (Zimmerman, 2018). It is evident that there is a combination of environmental and perinatal factors influencing feeding and developmental outcomes of infants born preterm and with LBW (Schoeman & Kritizinger, 2017; Zimmerman, 2018).

HIV infection or HIV-exposure is another etiology of feeding and developmental difficulties in infants (Seedat, 2013). In eastern and southern Africa, it is reported that 6% of infants are born to mothers with HIV (UNAIDS, 2016) with a 3,5% mother to child transmission rate (Department of Health, 2012). HIV/AIDS in infants is linked to both neurological and motor delay, both resulting in risk for feeding difficulty (Fourie, 2011). A neurological delay may cause oral sensorimotor difficulties (Field, Garland, & Williams, 2003). Neurological manifestations of HIV infection may also include progressive HIV encephalopathy (Rabie et al., 2007), which may cause a loss of feeding and swallowing milestones, motor deficits, and cognitive impairment (Van Rie, Harrington, Dow, & Robertson, 2007). A study in Tanzania found that HIV-exposed and HIV-infected infants both presented with cognitive and motor delays related to the cumulative risk of poor neurodevelopment (McGrath et al., 2006). Poor neurodevelopment is exacerbated by the environmental risk of poverty, the increased demand on families caring for these infants, as well as prolonged separation from the mother due to illness (McGrath et al., 2006). Infants in an HIV-affected household may not receive the appropriate stimulation and care, which increases the risk of developmental delay (McDonald et al., 2013). A study conducted in Thailand and Cambodia indicated that HIV-exposed infants had poor neurodevelopmental outcomes later in life (Kerr et al., 2014). The

cumulative impact of biological and environmental risk factors on feeding and developmental outcomes in infants that are HIV-exposed and HIV-infected is thus complex and requires further investigation (Guralnick, 2013; McGrath et al., 2006).

Another risk condition that places infants at risk for feeding and developmental difficulties is FASD (Nash & Davies, 2017). South Africa has the highest worldwide prevalence of FASD, particularly in the Western Cape province (13% - 20,9%) (May et al., 2013; Olivier et al., 2016). The feeding impairments characteristic of infants with FASD may be attributed to neurocognitive involvement as well as specific craniofacial abnormalities (Rendall-Mkosi et al., 2008; Werts, Van Calcar, Wargowski, & Smith, 2014). A multitude of cognitive or global developmental delay, emotional, and congenital anomalies are possible and can vary from mild to severe (Lange, Rovet, Rehm, & Popova, 2017). For example, fine motor, gross motor and feeding difficulties occur as a result of a deficit in adaptive functioning (Nash & Davies, 2017). Furthermore, it has been found that maternal characteristics may increase the severity of FASD symptoms (Nash & Davies, 2017). Maternal environmental factors include low socioeconomic status, low education level, and rural residence, which are prevalent risk factors in South Africa (May et al., 2013). The complexity of deficits in this population are evident (Lange et al., 2017). Feeding and developmental difficulties in this population are influenced by neurocognitive involvement, global developmental delay, craniofacial abnormalities and environmental risk factors (Lange et al., 2017; May et al., 2013; Nash & Davies, 2017; Werts et al., 2014).

Neonatal Abstinence Syndrome (NAS) was reported in 5,8 of 1000 hospital births in the United States of America (USA) in 2012 (Patrick, Davis, Lehman, & Cooper, 2015). It was estimated that between 0,31% and 0,5% of the child-bearing adult population in South Africa were using opioids in 2010 (United Nations Office on Drugs and Crime, 2018). Symptoms expressed by this population are multifactorial and unique to each pregnancy, making it difficult to define, assess, and treat NAS (Jansson & Velez, 2012). Physiological and neuro-behavioural problems manifest as difficulties in feeding, sleeping, movement, interactional capacity, and poor neonatal adaptation (Jansson & Velez, 2012). Long-term effects on language, cognition, behaviour, and school achievement have been reported (Lester & Lagasse, 2010). The symptoms of NAS are managed in the Neonatal Intensive Care Unit (NICU) until sufficient

recovery is achieved (Maguire et al., 2016). However, prolonged NICU stays are associated with sensory deprivation and overstimulation (Zimmerman, 2018). This, together with neuro-behavioural problems, present significant challenges to mother-infant attachment with negative consequences on infant development (Branjerdporn, Meredith, Strong, & Garcia, 2017; Maguire, Shaffer-Hudkins, Armstrong, & Clark, 2018). Further environmental risks include poor maternal mental and physical health, lack of financial resources, absence of a stimulating environment as well as neglect or abuse of the child (Guralnick, 2011; Jansson & Velez, 2012). The cumulative effect of physiological, neuro-behavioural and environmental factors on feeding and developmental difficulties is therefore evident (Branjerdporn et al., 2017; Jansson & Velez, 2012; Maguire et al., 2018; Zimmerman, 2018).

Apart from the influence of biological and established risk factors on early childhood development, successful growth is subject to the complex relationship between sociocultural, biomedical and physiological processes present during feeding (Berlin, Lobato, Pinkos, Cerezo, & LeLeiko, 2011). The intricacy of this complex relationship would explain the high prevalence of feeding difficulties in infants with developmental, medical, and behavioural conditions (Berlin et al., 2011). The cascading effect of early feeding difficulties affecting growth and nutrition, are often seen to influence an infant's developmental outcomes later in life (Black et al., 2016). Despite this, late entry (on average two years of age) into specialized care for infants with severe feeding problems, is the norm (Estrem, 2015). Infants are not identified early enough in LMIC to effectively treat the feeding difficulties and to prevent future developmental delays (Samuels et al., 2012). Unresolved early feeding problems may consequently exacerbate impaired development in at-risk populations, result in stunted growth, malnutrition or, in severe cases, lead to death (Berlin, Davies, Lobato, & Silverman, 2009).

1.3. The Developmental System's Approach: A common hierarchical framework

The etiologies of feeding and developmental outcomes in infants are heterogeneous and complex, leading to the involvement of multiple healthcare professionals (Borowitz & Borowitz, 2018; Estrem, 2015). Each discipline focuses on a particular aspect of the feeding problem in a child-centered multidisciplinary approach (Estrem, 2015). Selective intake of food and disruptive mealtime behaviour in infants and young children may, for example, be common problems being treated in Occupational Therapy, Speech-Language Therapy (SLT), and Psychology, but may be uncommon to professions of medicine and nursing (Estrem, Pados, Park, Knafl, & Thoyre, 2017). Healthcare professionals thus have difficulty identifying feeding difficulties in infants due to the complex relationship between biopsychosocial factors involved during feeding (Berlin et al., 2009; Estrem, 2015). Upon entry into specialized care for feeding difficulties, limited literature is available regarding discipline-specific attributes of feeding difficulties, and their impact on development and conversely, development and its impact on feeding (Estrem, 2015). The implementation of a common framework capable of organizing and analysing multiple professions' approaches and EI goals is therefore necessary (Guralnick, 2011).

Early childhood development is seen as hierarchical and is best understood within the Developmental System's Approach (DSA) in Figure 1 (Guralnick, 2005). Within the DSA, clinicians may define how an infant's level of development is influenced by family patterns of interaction and family resources to create a complex pattern of developmental growth (Guralnick, 2011). Environmental risks, such as economic disadvantage, may influence patterns of interaction between the family and infant, creating a disruption in parent-child transactions, family-orchestrated experiences, and health and safety provided by the family (Guralnick, 2013). The DSA also considers an interplay between protective and risk factors at all levels; however, infants at biological or established risk are less resilient to maintaining optimal levels of development during poor-quality family patterns of interaction (Guralnick, 2011).

Due to the complexity of the factors that may be present, there is a need to conceptualize the interaction between biological and environmental factors on feeding difficulties and early

childhood development in LMIC. Infants in an HIV-affected household, for example, may not receive the appropriate stimulation and care, which increases the risk of developmental delay (McDonald et al., 2013). Furthermore, having an infant with a developmental delay in the household may lead to the development of stressors within the family system, which negatively influences family patterns of interaction (Guralnick, 2013). Thus, developmental difficulties may influence parent-infant interaction as well as feeding abilities, creating a vicious cycle in infant development (Crapnell et al., 2015).

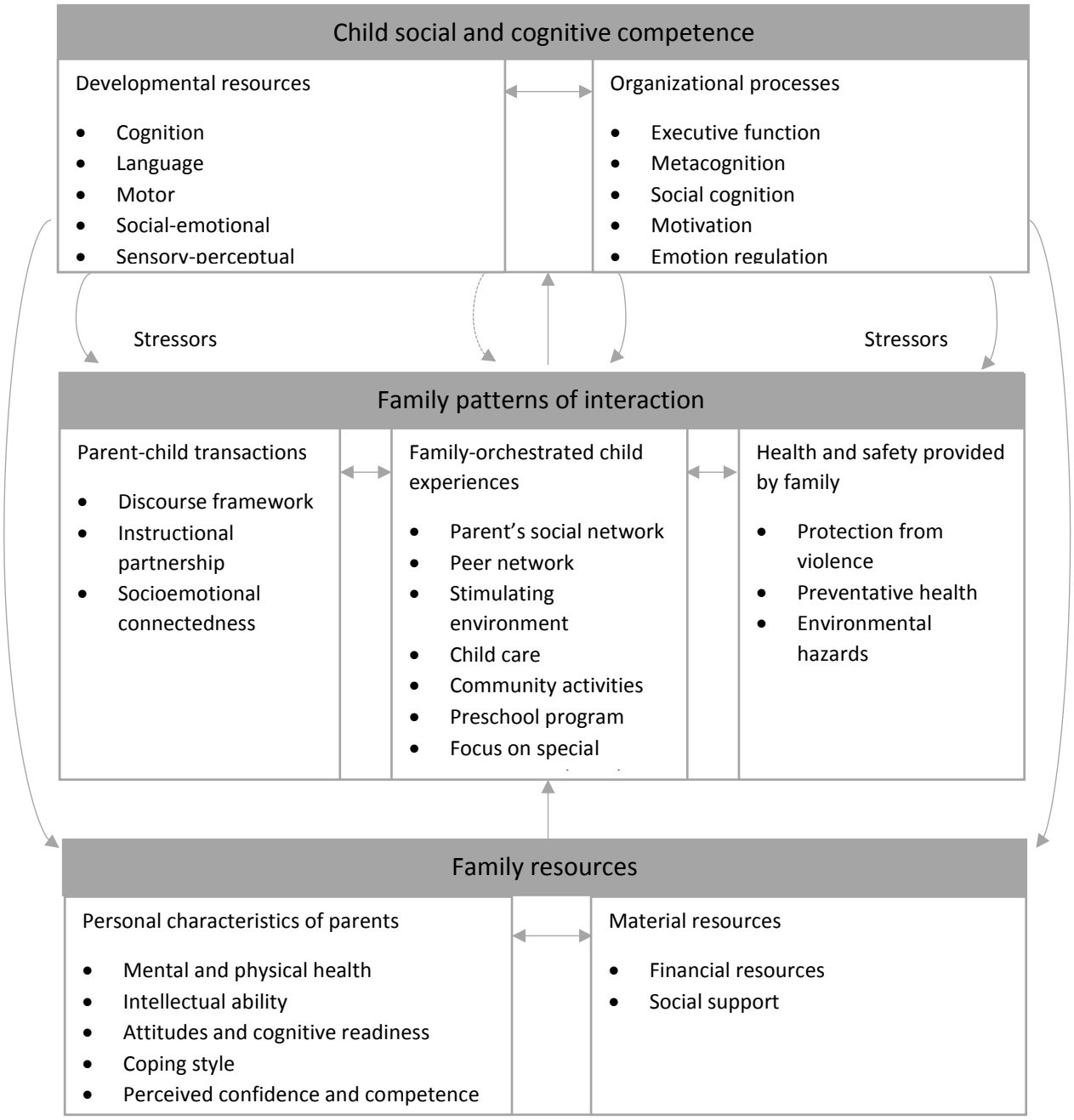

Figure 1: Developmental System's Approach (DSA). Levels, components and interrelationships are shown (Guralnick, 2011).

1.4. The role of the speech-language therapist

Stimulating and supportive social interactions influence an infant's early acquisition of language, which has shown to be a strong predictor of overall development (Glascoe & Leew, 2010). With the addition of cascading effects of feeding difficulties on developmental outcomes in infants, the interactions between environmental and biological factors become increasingly complex (Black et al., 2016; Guralnick, 2011). SLTs possess specialised knowledge in screening, assessing, and treating atypical early development of communication, language, cognition, emergent literacy, and social/emotional behaviour (American Speech-Language-Hearing Association [ASHA], 2008). Furthermore, SLTs play a primary role in evaluating and treating feeding/swallowing disorders as they have a comprehensive understanding of the signs and symptoms of feeding disorders and oropharyngeal dysphagia, normal and abnormal physiology related to swallowing function, and knowledge of medical issues related to feeding and swallowing disorders (ASHA, 2002; ASHA, 2008). Conversely, occupational therapists focus on advancing an infant's independence of feeding and eating (i.e. the action of bringing food to the mouth and keeping and manipulating food in the mouth before swallowing) (Boop & Smith, 2017). The SLT's role in providing EI services to this population is therefore clear (ASHA, 2008).

The SLT may be the first point of contact in the healthcare system, thus playing an important role in referring to, or enlisting the help of, other EI healthcare professionals such as occupational therapists and dieticians (ASHA, 2008). SLTs observe and share their findings on developmental areas specific to other professions (such as fine and gross motor development) during assessment and treatment sessions as these may influence the typical progression of communication and feeding development (ASHA, 2008). Developmental monitoring and surveillance is an effective family-centered strategy used to identify infants with developmental difficulties, provide parent education and support, and to refer infants for further assessment and treatment (Richter et al., 2017). Various policies have been created to guide healthcare professionals in this EI process; however, these policies do not specify how these services should be coordinated (Samuels et al., 2012). EI practitioners such as SLTs, physiotherapists and occupational therapists tend to work independently of one another (Mckenzie & Müller, 2006). EI services are therefore often uncoordinated due to a

child-centered multidisciplinary approach used when assessing infants at-risk (Samuels et al., 2012). Consequently, intervention goals are based on this assessment data, resulting in domain-specific goals, which fail to account for environmental conditions that may maintain or exacerbate developmental delays (Samuels et al., 2012). The use of the DSA and a transdisciplinary approach may close this gap by allowing for the analysis of current approaches and how these may be adapted to improve the access to EI services in South Africa (Guralnick, 2011; Samuels et al., 2012). Furthermore, this would ensure that services are: family-centered and culturally responsive; developmentally supportive and promote infant's participation in their natural environments; comprehensive, coordinated, and team-based; and based on the highest quality internal and external evidence that is available (ASHA, 2008).

1.5. Problem statement and rationale

The importance of early identification of developmental and feeding difficulties in infants is evident. EI programs in primary health care (PHC) settings in LMIC are overburdened due to limited numbers of healthcare professionals, as well the lack of resources and facilities to implement EI services (Samuels et al., 2012). Yet, the identification of risk factors that lead to feeding difficulties and developmental delay in early childhood should be prioritised (Van der Linde et al., 2015). This would strengthen primary preventative strategies, such as developmental and feeding screening, surveillance, and intervention, in order to compensate for risks and to reduce or eliminate resultant feeding or developmental delay (Van der Linde et al., 2015). Early identification of feeding difficulties in infants would improve the monitoring of developmental outcomes and vice versa (Barratt & Ogle, 2010). Thus, the following research question arises: What is the relationship between feeding and developmental difficulties in infants aged six to twelve months in an underserved community?

1.6. Clarification of terms used in the dissertation

1.6.1. **Feeding difficulties:** Feeding is distinct from swallowing as it involves the process of gathering or preparing food and liquid for intake, sucking and chewing, and swallowing (Arvedson & Brodsky, 2002). In basic terms, feeding is characterised by specific anticipatory reactions, food getting, and placement of food in the mouth and may occur with or without a swallowing disorder (Delaney & Arvedson, 2008). Feeding as a broader term includes the interaction between the caregiver and the infant (Delaney & Arvedson, 2008). Feeding difficulties may therefore be distinguished by atypical progression of feeding development with attributes of problematic feeding behaviours and restrictive or selective intake (Arvedson, 2008; Borowitz & Borowitz, 2018; Estrem et al., 2017).

1.6.2. **Swallowing:** Swallowing is a complex process during which saliva, liquid, and food is transported from the mouth to the stomach (Arvedson & Brodsky, 2002). A swallowing disorder thus occurs when there is a problem in any of the four phases of swallowing, i.e. the oral, oral-preparatory, pharyngeal, and oesophageal phases of swallowing (Arvedson, 2008).

1.6.3. **Environmental risk factor:** The absence or limitation of early experiences that include health care, parental care, and exposure to physical and social stimulation (ASHA, 2008). Stressors may include:

- Personal characteristics of parents/caregivers: Parents/caregivers may present with poor mental health, which may interfere with the family patterns of interaction. Inappropriate child-rearing practices and attitudes may also exist, further influencing the family's pattern of interaction.
- Financial resources: The family may be living in less than optimal circumstances and may be experiencing depletion of disposable income (e.g. economic disadvantage).
- Social supports: Families experiencing absence of supportive family, friend, and community networks may struggle to cope with the added stressors within the family system.

- Infant characteristics: An infant's lack of resilience, social-emotional connectedness, and poor temperament may affect the family's pattern of interaction. This may further influence their ability to adjust to their infant's characteristics.

  (Guralnick, 2013; Guralnick, 2011)

1.6.4. **Biological risk factor:** History of prenatal, perinatal, neonatal, and developmental events that may influence the typical progression of development (e.g. preterm birth and LBW). Categories of stressors interfering with the family's patterns of interaction as a result of an infant at biologic or established risk for feeding or developmental difficulties include (Guralnick, 2011):

- Information needs: When the family does not understand the implications of a diagnosis or influence it may have on feeding and/or developmental difficulties.
- Interpersonal and family distress: Reconsidering the family's priorities in light of the infant's feeding and/or developmental difficulty and preparing for possible discrimination from others.
- Resource needs: Financial burdens and challenges related to the provision of social support networks may lead to families exhausting their material resources.
- Confidence threats: The presence of stressors on the family's resources may decrease their belief in their ability to cope and be effective caregivers of their infant with feeding and/or developmental difficulties.

  (Guralnick, 2013; Guralnick, 2011)

1.7. Outline of chapters presented in the dissertation

A brief outline of the content presented in the chapters of the dissertation is presented below.

- **Chapter 1:** Introduction to the topic, problem statement and rationale, and clarification of terminology used in the dissertation.
- **Chapter 2:** A comprehensive discussion of the method used in the study including the aim, research design, ethical considerations, participant information, materials and apparatus, procedures, data analysis, and reliability and validity.

- **Chapter 3:** Research article submitted to the journal *Infants & Young Children*. The formatting of chapter 3 differs to that of the rest of the dissertation as it was structured according to the author guidelines of the journal.
- **Chapter 4:** A comprehensive look at the findings, contributions, theoretical and clinical implications, strengths and limitations, recommendations for future research, and conclusion.

CHAPTER 2

METHOD

Chapter aim and outline

This chapter provides an in-depth description of the research process involved in the current study. The research aim, design, and ethical considerations are described. Detailed descriptions of the participants, setting, and materials are provided for an understanding of the study population and the materials used to gather information about the participants' feeding characteristics and developmental outcomes. A discussion of the procedures for data-collection and data analysis, and reliability and validity follow to conclude the chapter.

2.1. Aim

The aim of the current study was to determine the relationship between feeding characteristics and general developmental outcomes in infants aged six to twelve months in an underserved South African community.

2.2. Research design

A retrospective quantitative research design was employed in the current study. This design allowed for the investigation of a large sample previously collected (Kuzma, 2005; Neuman, 2014). A previous study collected data on the feeding and developmental skills of infants aged six to twelve months at an immunization clinic in an underserved community in the Tshwane District of the Gauteng Province. Extraction of a sample of this data then occurred for the current study's investigation into the relationship between feeding and developmental characteristics.

2.3. Ethical considerations

Ethical clearance was obtained for this study (GW20180121HS) from The Research Ethics Committee of the Faculty of Humanities at the University of Pretoria (Appendix A). The previous study obtained ethical clearance (GW20170112HS) and consent from the Tshwane Research and Ethics Committee of the Gauteng Department of Health in 2017 that also provided permission to the current study to use the dataset (Appendix B). The current study recognized the following standards of ethical conduct in research:

- ***Beneficence:*** Informed consent was obtained in the initial study in order to ensure the participants' understanding of the research. Furthermore, participants were referred to the allied health professionals at the PHC clinic for comprehensive health services in the case of the presence of feeding difficulties or developmental delay (American Psychological Association, 2016).

- ***Confidentiality/anonymity:*** Confidentiality ensures the protection of the research participant's personal information (Neuman, 2014). During the previous study, each participant was assigned a number/code instead of using identifying information. Confidentiality and anonymity were therefore maintained in the current study as no personal identifying information was used during data analysis or reporting of the findings. The previous study further established the participants' understanding of data retention for the current study's access for analytic and reporting purposes. Anonymity may be viewed as a protective method employed to allow participants the freedom to provide sensitive information and thus, ensuring confidentiality (Neuman, 2014; Oliver, 2003). To further assure the participant's anonymity, the setting of data collection was not named but rather referred to as an immunization clinic in the Tshwane District.

- ***Data storage:*** To comply with institutional guidelines at the University of Pretoria, data will be stored electronically on a password-protected computer in room 3-14 in the Department of Speech-Language Pathology and Audiology at the University of Pretoria for 15 years. Other researchers may have access to these archived data sets upon peer

review of the data collection procedure followed, as well as after consulting the Research Ethics Committee of the Faculty of Humanities at the University of Pretoria (Oliver, 2003).

- ***Analysis and reporting:*** The integrity of the research findings were maintained in the current study (American Psychological Association, 2016). Science progresses through honest reporting and openness about the process, whether the hypothesised outcomes occur, or not (Babbie, 2001). All the findings from the complete data set of the previous study were included in the current study. The researcher acknowledged the pitfalls and limitations of the current study to guide future research.

- ***Plagiarism:*** All consulted sources were referenced according to the American Psychological Association guidelines (American Psychological Association, 2010). The current study acknowledged other researchers findings and did not claim ownership of other researchers work (American Psychological Association, 2016). Other researchers' work was cited throughout the current study.

2.4. Setting

The previous study collected data at an immunization clinic in an underserved community in the Tshwane District in the Gauteng province of South Africa. This community's total area is approximately 25 km² and has an estimated population of close to a million people (Darkey & Visagie, 2013). A substantial amount of the population lives in informal settlements comprising mostly of self-built houses (Mashigo, 2012). The people residing in this community use the PHC clinic as their first point of access to health care. Infants in South Africa attend an immunization clinic at six, nine, and twelve months of age; however developmental screening is not required by law during these visits (National Institute for Communicable Diseases, 2016; Samuels et al., 2012).

2.5. Participants

2.5.1. Selection criteria:

The data were retrospectively reviewed and therefore, only data that were specific to the proposed study were used and reported on. In the initial study, if a language barrier existed, an interpreter was used to ensure the inclusion of all participants within the age range attending the immunization clinic. The selection criteria included data on all infants between the ages of six and twelve months. The current study only used complete data sets and excluded any with missing data.

2.5.2. Sampling method:

The previous study made use of convenience sampling over a period of four months. All parents/caregivers of infants aged six to twelve months attending the PHC immunization clinic were asked to participate in the study. There were 250 participants whose parents/caregivers provided voluntary informed consent in the previous study; however, after the exclusion of missing data, a sample of 144 participants was included in the current study.

2.5.3. *Participant description:*

Table 1 presents the participant characteristics. The small majority of the sample (n=81; 56,3%) were male with a mean age of 8,5 months (standard deviation [SD] = 2,2). The minimum and maximum age was six and twelve months respectively. Most of the primary caregivers were mothers (n=132; 91,7%) with a Black ethnic background (100%). Many participants (n=104; 72,3%) were living in an informal dwelling and most of the caregivers (n=111; 77,1%) were unemployed.

Table 1: Description of participants (n=144)

Characteristic	**Category**	***N = 144***	**%**
Gender of infant	Male	81	56,3
	Female	63	43,8
Age of infant (months)	Mean (*SD)*	8,5 (*2.2)*	-
Primary caregiver	Mother	132	91,7
	Grandparents	7	4,9
	Extended family	4	2,8
	Both parents	1	0,7
Age of caregiver (years)	17-20	10	6,9
	21-30	92	63,9
	31-40	36	25,0
	41-50	6	4,2
Education of caregiver	Less than Grade 8	6	4,2
	Grade 8 to Grade 10	12	8,3
	Grade 11 to Grade 12	110	76,4
	Diploma/degree	16	11,1
Housing status	Informal dwelling	104	72,3
	Formal dwelling	39	27
Employment status of primary caregiver	Employed	33	22,9
	Unemployed	111	77,1
Home language	IsiZulu	21	14,6
	Sepedi	71	49,3
	Sesotho	11	7,6
	Xitsonga	12	8,3

2.6. Material and apparatus

The previous study conducted feeding screening and feeding assessment with infants aged six to twelve months in a PHC immunization clinic in the Tshwane District. Expectations for transition skills in feeding are related to the infants' general development; thus, a developmental screening followed in order to investigate this relationship between feeding and general development (Arvedson, 2008). The following screening and assessment tools were used in the previous study:

- ***Questionnaire***

Data were obtained from a background participant and family information questionnaire comprising of 57 questions (Van der Linde, Swanepoel, Glascoe, Louw, & Vinck, 2015) (Appendix C). The questionnaire was adapted and contains subsections on infant and caregiver information as well as infant feeding history and development. The following are sections within the questionnaire:

- Section 1: Infant information

  The first section focuses on the infant's birth information such as date of birth, age, weeks premature, HIV exposure and status as well as treatment for HIV if applicable. It contains six closed-ended and two opened-ended questions.

- Section 2: Caregiver information

  Data collected from the second section consisted of thirteen closed-ended questions about the caregiver's relation to the infant, home language, population group, and employment and housing status. Each parent's highest educational qualification and marital status follows. Six open-ended questions were also included and contained information about the caregiver's and mother's age, number of children the mother has given birth to and how many are living, the average household income as well as number of people living in the household. Data from this section provided information about the parent or caregiver's socioeconomic and educational status as well as psychosocial factors possibly influencing the infant's feeding and developmental outcomes.

- Section 3: Infant feeding history and development

  The infant's feeding history and development of transitional feeding skills followed, with emphasis on identifying possible risk factors. This section included twenty closed-ended

and fourteen open-ended questions. Information about neonatal feeding difficulties such as enteral feeding, breastfeeding status, and hospital stay, and information on infant feeding difficulties during breastfeeding, bottle-feeding and/or cup-feeding, as well as solid food introduction were collected.

- ***The Montreal Children's Hospital – Feeding Scale (MCH-FS)***

The MCH-FS (Ramsay, Martel, Porporino, & Zygmuntowicz, 2011) is a parent-reported screening tool for feeding, targeting young children aged six months to six years of age (Appendix D). It is based on the biopsychosocial model of feeding difficulties. Items in the MCH-FS include oral sensorimotor skills and appetite. Parent concerns relating to feeding, mealtime behaviour, mealtime strategies used, and family reactions to their infant's feeding, were also investigated. The MCH-FS is a valid and reliable means of assessing an infant's feeding behaviour (Barton, Bickell, & Fucile, 2017; Sanchez, Spittle, Allinson, & Morgan, 2015). It demonstrates appropriate specificity and sensitivity and its application can be extended to the general population, which was beneficial to the current study (Barton et al., 2017; Benjasuwantep, Rattanamongkolgul, & Ramsay, 2015; Sanchez et al., 2015). The MCH-FS was used to identify the presence of possible feeding difficulties in order to further assess the extent of these difficulties.

Parental report is valuable as parents observe their infants' feeding behaviour across all mealtimes and can thus provide a comprehensive view of the infants' feeding behaviour (Sanchez et al., 2015). A pilot study conducted on infants aged nine to eighteen months indicated that parental report of feeding problems was predominantly related to food refusal and less efficient feeding (Van Dijk, Bruinsma, & Hauser, 2016). Van Dijk et al. (2016) has shown preliminary evidence that the MCH-FS demonstrates concurrent validity as the results were associated with specific indicators of feeding difficulties. With a high prevalence of feeding disorders expected worldwide, the use of an effective quick screening tool was necessary to detect feeding difficulties in a smaller population such as in an immunization clinic in the Tshwane District (Ramsay et al., 2011). The maturational component of feeding development makes feeding parameters universal (Benjasuwantep et al., 2015). This, combined with the instinctual maternal component, further demonstrates the beneficial

application of the MCH-FS in a culturally-diverse population (Benjasuwantep et al., 2015; Ramsay et al., 2011).

- ***Schedule for Oral-Motor Assessment (SOMA)***

The SOMA is a clinical assessment tool that assesses oral-motor skills and is designed to be used with other rating scales, such as the MCH-FS (Rogers & Arvedson, 2005) (Appendix E). An experienced clinician should be able to administer the assessment in 15 to 20 minutes, and complete the scoring within 10 to 20 minutes (Rogers & Arvedson, 2005). The SOMA objectively assesses oral-motor skills in infancy (Reilly, Skuse, Mathisen, & Wolke, 1995), but does not account for behavioural and postural aspects of feeding (Rogers & Arvedson, 2005). The SOMA evaluates feeding abilities for various textures including liquid, puree, semisolid, solid, and biscuits. The inclusion of a variety of textures allowed the clinician to evaluate the skill needed for each category as infants aged six to twelve months should be capable of progressively coping with each (Delaney & Arvedson, 2008). The SOMA presents with strong content validity, test-retest reliability, and inter-rater reliability in assessing feeding skills in both infants with developmental difficulties and the general population (Barton et al., 2017; Benfer, Weir, & Boyd, 2012; Skuse, Stevenson, Reilly, & Mathisen, 1995). When compared to instrumental assessments, the SOMA demonstrates 87,5% sensitivity, 66,6% specificity, and a 95,4% predictive value in identifying oral-motor dysfunction (Ju Ko et al., 2011). Thus, the SOMA was deemed a valuable tool to diagnose infants with oral-motor dysfunction in feeding, should they fail the MCH-FS feeding screening.

- ***Parent's Evaluation of Developmental Status (PEDS) and Parent's Evaluation of Developmental Status – Developmental Milestones (PEDS-DM)***

The PEDS identifies parental/caregiver concern regarding global/cognitive, receptive language, expressive language and articulation, fine motor, gross motor, behaviour, social-emotional, and self-help skills (Glascoe, 1997) (Appendix F). The PEDS uses an algorithm specified by pathways A to E for referral (Glascoe, 1997). Pathway A is considered a fail and E indicates a pass, whereas pathways B to D represent a referral to the PEDS-DM where a pass or fail will be determined. The PEDS-DM was designed for children aged birth to eight years and is used to identify potential areas of developmental delay (Brothers, Glascoe, & Robertshaw, 2008) (Appendix G). It consists of six to eight items per age range representing

different developmental domains, which includes gross motor skills, fine motor skills, social-emotional skills, self-help skills, receptive language development, and expressive language development. The PEDS-DM is a valid and reliable milestones-focused measure that is based on parental report (Brothers et al., 2008). It demonstrates high sensitivity and specificity scores (82% and 83% respectively) in infants from birth to twelve months (Van der Linde et al., 2015). A recent study confirmed the accuracy of the application of the PEDS and PEDS-DM as a mobile health (mHealth) tool to the South African population (Maleka, Van der Linde, Glascoe, & Swanepoel, 2016). Thus, the PEDS and PEDS-DM was deemed an appropriate tool to use within the PHC context for the purpose of this study (Van der Linde et al., 2015).

2.7. Procedures

During the initial study, data were prospectively collected for four months (May 2017 – June 2017) by one researcher with a Bachelor degree in Speech-Language Pathology who was qualified in assessing infants and registered with the Health Professions Council of South Africa (HPCSA) as a student clinician. The parent/caregiver was interviewed using the background questionnaire. Thereafter the MCH-FS was administered as a screening tool in a structured interview with each parent or caregiver of a participant. The SOMA was conducted directly after by the same researcher if the participant failed the screening. An assessment of each participant's development was then conducted using the PEDS and PEDS-DM. Participants who failed the feeding screening and/or developmental assessment were referred to allied health services at the clinic for further feeding and/or developmental assessments and intervention. Caregivers were given the opportunity to ask the researcher any questions upon completion of the session. Each caregiver was additionally given an informative fact sheet about feeding and developmental milestones for their infant's age range. The current study obtained the data of the entire sample of 250 infants but extracted 144 complete data sets for analysis.

2.8. Data analysis

The relationship between feeding and developmental outcomes was investigated by retrospectively analysing data of 144 participants using bivariate analysis. Descriptive analysis from the MCH-FS indicated that only seven of the 144 participants failed the feeding screening and were referred for assessment using the SOMA. Due to the small number of participants who underwent assessment using the SOMA, this data were excluded from further analysis in the current study. The spearman's rho was used to measure correlations between the feeding history of the participants and the PEDS and PEDS-DM outcomes. Correlations between items and raw scores from the MCH-FS and the PEDS and PEDS-DM outcomes were also investigated. Furthermore, the phi-coefficient was used to measure associations between participants' feeding history and development and the PEDS and PEDS-DM outcomes. A *p*-value of less than or equal to 0.05 was considered statistically significant.

2.9. Reliability and validity

The entire data set from the previous study was scrutinised and 144 complete data sets were used to maintain internal validity (Leedy & Ormrod, 2010). The data spreadsheets from the previous study were also collated and structured with the help of a statistician, further increasing reliability. Representative reliability was thus achieved by reporting on all the participants from the previous study without exclusion (Neuman, 2014). One person collected data in the initial study, ensuring that measurement reliability was also attained (Neuman, 2014). Professionals use their own philosophies in the conceptualization of the definitions of feeding difficulties, which creates conflicting categorisation of feeding difficulties (Bryant-Waugh et al., 2010; Estrem, 2015). Clear and concise definitions of feeding difficulties and general developmental outcomes were therefore explicitly discussed to further strengthen reliability in the current study (Neuman, 2014). External validity was assured from the previous study's use of convenience sampling and ensuring content validity of the assessment material chosen (Leedy & Ormrod, 2010; Neuman, 2014). The MCH-FS, SOMA, PEDS, and PEDS-DM demonstrated appropriate validity and reliability.

CHAPTER 3

RESEARCH ARTICLE

Chapter aim and outline

This chapter contains the article based on the current research project submitted to an American academic journal (Appendix H). The research article was submitted to *Infants and Young Children* and is currently in review. The formatting of the article differs to that of the dissertation as it was structured according to the author guidelines and style of the journal.

Feeding and Developmental Outcomes of Infants in an Underserved Community

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Abstract

Prevalent environmental risk factors place infants in underserved communities at an increased risk for feeding and developmental difficulties. The current study aimed to determine the relationship between feeding and developmental outcomes in infants in this context as early feeding difficulties may have a cascading effect on developmental outcomes and vice versa. Data on 144 infants' feeding and development (mean age [SD] = 8,8 months [2,2]) from a primary health care clinic in the Gauteng province of South Africa were retrospectively analyzed. The spearman's rho and phi-coefficient were used to determine associations between the infants' feeding characteristics and developmental outcomes. Early introduction of cup feeding was found to be a predictor of possible expressive language and articulation difficulties. Gagging, spitting, or vomiting, pocketing, the use of force feeding, and poor sucking and chewing abilities were significantly associated with behavioral and social-emotional difficulties. Breastfeeding was found to be a protective factor for language development. The results emphasize the importance of primary preventative strategies and the early identification of risk factors in late infancy in underserved communities. **Key words:** *infant feeding, infant development, low- and middle-income countries, underserved community, early intervention, South Africa*

Infants from low- and middle-income countries (LMIC) are more adversely affected by biological and psychosocial risks than infants from high-income countries (Lu, Black, & Richter, 2016). South Africa, a LMIC, is characterized by poverty, which is associated with family stress, child abuse or neglect, food insecurity and exposure to violence (Black et al., 2016). An estimated 25% of South Africans are living in extreme poverty and 56% are living under the poverty line (Statistics South Africa, 2017). Extreme poverty may lead to inappropriate

feeding environments, as well as the presence of hostility and disorganization, often creating a delay or impairment in feeding and developmental outcomes of an infant (Aldridge, Dovey, Martin, & Meyer, 2010; Daelmans et al., 2016).

Approximately 56% of children in LMIC are at risk of poor developmental outcomes (Lu et al., 2016) due to the combined effect of poverty and other risk factors. Environmental risks, such as economic disadvantage, housing status, age of the mother, and number of siblings may influence patterns of interaction between the family and infant, creating a disruption in parent-child transactions, family-orchestrated experiences, and health and safety provided by the family (Guralnick, 2013). These environmental risks are associated with delayed language, social, and cognitive development in infants, highlighting the importance of early intervention (EI) for general developmental outcomes in LMIC's (Guralnick, 2013; Samuels, Slemming, & Balton, 2012; Van der Linde et al., 2016). South Africa also has a high prevalence of biological risks, such as preterm birth, low birth weight, HIV/AIDS, Fetal Alcohol Spectrum Disorder, and Neonatal Abstinence Syndrome, that lead to feeding and developmental delays in infants (Blencowe et al., 2012; UNAIDS, 2016; Olivier, Curfs, & Viljoen, 2016; Weich et al., 2017; WHO, 2012).

Successful growth in early childhood is subject to the complex relationship between sociocultural, biomedical and physiological processes present during feeding (Berlin, Lobato, Pinkos, Cerezo, & LeLeiko, 2011). The cascading effect of early feeding difficulties affecting growth and nutrition, are often seen to influence an infant's developmental outcomes later in life (Black et al., 2016). However, infants may not be identified early enough in LMIC to effectively treat the feeding problems and to prevent future developmental delays (Samuels

et al., 2012). Unresolved early feeding difficulties may consequently exacerbate impaired development in at-risk populations, result in stunted growth, malnutrition or, in severe cases, lead to death (Berlin, Davies, Lobato, & Silverman, 2009). Investigation of the relationship between feeding and developmental outcomes in infants is therefore warranted.

The etiologies of feeding and developmental outcomes in infants are heterogeneous and complex, leading to the involvement of multiple healthcare professionals (Borowitz & Borowitz, 2018; Estrem, 2015). Each discipline focuses on a particular aspect of the feeding problem in a child-centered multidisciplinary approach (Estrem, 2015). Selective intake of food and disruptive mealtime behavior in children may, for example, be common problems being treated in Occupational Therapy, Speech-Language Pathology, and Psychology, but uncommon to the professions of medicine and nursing (Estrem, Pados, Park, Knafl, & Thoyre, 2017). Healthcare professionals may have difficulty identifying feeding difficulties in infants due to the complex relationship between biopsychosocial factors involved during feeding (Berlin et al., 2009; Estrem, 2015). Upon entry into specialized care for feeding difficulties, limited literature is available regarding discipline-specific attributes of problematic feeding, and the impact on development and conversely, development and its impact on feeding (Estrem, 2015). A common framework capable of organizing and analyzing multiple professions' approaches and EI goals is necessary (Guralnick, 2011).

The Developmental Systems Approach (DSA) considers an interplay between protective and risk factors at all levels and infants who have biological or established risks are less resilient to maintaining optimal levels of development during poor-quality family patterns of interaction (Guralnick, 2011). Due to the complexity of the factors that may be present, there

is a need to conceptualize the interaction between biological and environmental factors on feeding difficulties and early childhood development in LMIC. Infants in an HIV-affected household, for example, may not receive the appropriate stimulation and care, which increases the risk of developmental delay (McDonald et al., 2013). Furthermore, having an infant with a developmental delay in the household may lead to the development of stressors within the family system, which negatively influences family patterns of interaction (Guralnick, 2013). Thus, developmental difficulties may influence parent-infant interaction as well as feeding, creating a vicious cycle in infant development (Crapnell, Woodward, Rogers, Inder, & Pineda, 2015).

The importance of early identification of developmental and feeding difficulties in infants is evident. EI programs in primary healthcare settings in LMIC are overburdened due to limited numbers of healthcare professionals, as well the lack of resources and facilities to implement EI services (Samuels et al., 2012). Yet, the identification of risk factors that lead to feeding difficulties and developmental delay in early childhood should be prioritized (Van der Linde et al., 2015). This would strengthen primary preventative strategies, such as developmental screening, surveillance, and intervention, in order to compensate for risks to reduce or eliminate resultant feeding or developmental delays (Van der Linde et al., 2015). Early identification of feeding problems in infants would improve the monitoring of developmental outcomes and vice versa (Barratt & Ogle, 2010). The current study aimed to determine the relationship between feeding characteristics and general developmental outcomes in infants aged six to twelve months in an underserved community.

METHOD

Setting

Data were prospectively collected at a well-baby immunization clinic in an underserved community in the Tshwane District, Gauteng province of South Africa in a previous study. This community is approximately 9,65 mi² with an estimated population of close to a million people (Darkey & Visagie, 2013). The majority of the population lives in informal settlements comprising mostly of self-built houses (Mashigo, 2012). The people residing in this community use the primary healthcare clinic as their first point of access to health care. Infants in South Africa attend an immunization clinic at six, nine, and twelve months of age, but developmental screening is not required by law during these visits (National Institute for Communicable Diseases, 2016; Samuels et al., 2012).

Participants

Convenience sampling was used to recruit infants aged six to twelve months in a previous study. In the present study, 144 complete data-sets were retrospectively analyzed. Table 1 presents the participant characteristics. The small majority of the sample (n= 81; 56,3%) were male with a mean age (SD) of 8,5 months (2,2). Most of the primary caregivers were mothers (91,7%) with a Black ethnic background (100%). Many participants (72,3%) were living in an informal dwelling and most of the caregivers (77,1%) were unemployed.

Table 1: Description of participants

Description	**Category**	***N = 144***	**%***
Gender of infant	Male	81	56,3
	Female	63	43,8
Age of infant (months)	Mean (*SD)*	8,5 (*2.2)*	-
Primary caregiver	Mother	132	91,7
	Grandparents	7	4,9
	Extended family	4	2,8
	Both parents	1	0,7
Age of caregiver (years)	17-20	10	6,9
	21-30	92	63,9
	31-40	36	25,0
	41-50	6	4,2
Education of caregiver	Less than Grade 8	6	4,2
	Grade 8 to Grade 10	12	8,3
	Grade 11 to Grade 12	110	76,4
	Diploma/degree	16	11,1
Housing status	Informal dwelling	104	72,3
	Formal dwelling	40	27,7
Employment status of primary caregiver	Employed	33	22,9
	Unemployed	111	77,1
Home language	IsiZulu	21	14,6
	Sepedi	71	49,3
	Sesotho	11	7,6
	Xitsonga	12	8,3

** All figures are rounded off to one decimal place*

Measures

Background information was obtained from a questionnaire comprising of 57 questions (Van der Linde, Swanepoel, Glascoe, Louw, & Vinck, 2015). The questionnaire provided information about the parent/caregiver's socioeconomic and educational status, as well as psychosocial factors, such as poor environmental stimulation and problematic parent-child interactions, possibly influencing the infant's feeding and developmental outcomes (Berlin et al., 2011). Information on the participants' feeding history and the current development of skills were also obtained.

A screening of each participant's feeding ability was conducted using the Montreal Children's Hospital Feeding Scale (MCH-FS) (Ramsay, Martel, Porporino, & Zygmuntowicz, 2011). Items in the MCH-FS included oral sensorimotor skills and appetite. Maternal concerns relating to feeding, mealtime behavior, mealtime strategies used, and family reactions to the participant's feeding, were investigated. Finally, an assessment of each participant's development was conducted using the Parent's Evaluation of Developmental Status (PEDS) tools, which includes the PEDS and Parent's Evaluation of Developmental Status – Developmental Milestones (PEDS-DM) (Brothers, Glascoe, & Robertshaw, 2008). The PEDS identifies parental/caregiver concern regarding global/cognitive, receptive language, expressive language and articulation, fine motor, gross motor, behavior, social-emotional, and self-help skills (Glascoe, 1997). The PEDS uses an algorithm specified by pathways A-E for referral (Glascoe, 1997). Pathway A is considered a fail and E indicates a pass, whereas pathways B-D represent a referral to the PEDS-DM where a pass or fail will be determined. The PEDS-DM consists of six questions regarding the infant's developmental milestones.

Developmental domains assessed include fine motor, receptive language, expressive language, gross motor, self-help and social emotional skills.

Procedure

Institutional ethical clearance was obtained and data were collected prospectively for four months by a researcher with a Bachelor degree in Speech-Language Pathology. The parent/caregiver was interviewed using the background questionnaire. Thereafter the MCH-FS was administered as a screening tool in a structured interview with each parent/caregiver. An assessment of each participant's general development was then conducted using the PEDS and the PEDS-DM.

Data-analysis

The relationship between feeding and developmental outcomes was investigated by retrospectively analyzing data on 144 complete datasets using bivariate analysis. Spearman's rho was used to measure correlations between the feeding history of the participants and the PEDS and PEDS-DM outcomes. Correlations between items and raw scores from the MCH-FS and the PEDS and PEDS-DM outcomes were also investigated. Furthermore, the phi-coefficient was used to measure associations between infants' feeding history and development and the PEDS and PEDS-DM outcomes. A p-value of less than or equal to 0.05 was considered statistically significant.

RESULTS

The feeding characteristics of the sample are shown in Table 2. Interestingly, 123 (85,4%) infants had been breastfed. Bottle-feeding was initiated between zero to six months in 81 (56,3%) infants while cup feeding was introduced between one and five months in 18 (12,5%) infants. Of the 144 infants, 103 (71,5%) had already commenced with spoon feeding.

Table 2: Feeding characteristics

Description	**Response**	***N =144***	***%***
Neonatal feeding difficulties	Yes	8	5,6
Colostrum	Yes	121	84
Type of milk given	Breastmilk	76	52,8
	Formula	51	35,4
	Mixed feeding: breastmilk and formula	17	11,8
Breastfed	Yes	123	85,4
Duration of breastfeeding	6 months or less	53	36,8
	More than 6 months	66	45,8
Method	Direct breastfeeding	116	80,6
Length of breastfeeding session:	5 minutes	28	19,4
	10 minutes	23	16
	15 minutes	20	13,9
	20-25 minutes	15	6,9
Bottle feeding	Yes	110	76,4
Duration of bottle-feeding:	0-6 months	81	56,3
	7-10 months	20	13,9

	More than 10 months	10	6,9
Length of bottle-feeding session:	5 minutes	43	29,9
	10 minutes	13	9
	15 minutes	11	7,6
	20-25 minutes	5	3,5
Cup feeding	Yes	71	49,3
Age of cup introduction:	1-5 months	18	12,5
	6-8 months	43	29,9
	More than 8 months	10	6,9
Age of solid food introduction:	4-5 months or less	9	6,3
	6-8 months	92	63,9
	9-10 months or more	8	5,6
Method:	Spoon feeding	103	71,5
	Mother's hand	6	4,2
Number of tablespoons per meal:	1-5 tablespoons	79	54,9
	6-10 tablespoons	29	20,1

Seven infants (4,9%) failed the MCH-FS. Of the seven infants, five were classified as having a mild feeding difficulty, while the remaining two infants were evenly distributed between moderate and severe feeding difficulty. Item-specific results for the MCH-FS are shown in Table 3.

Table 3: Item-specific results of the MCH-FS

Question	Response	N=144	%
1. How do you find mealtimes with your child?	Very difficult	14	9,7
	Easy	130	90,3
2. How worried are you about your infant's feeding?	Not worried	130	90,3
	Very worried	14	9,7
3. How much appetite (hunger) does your child have?	Never hungry	6	4,2
	Good appetite	138	95,8
4. When does your child start refusing to eat during mealtimes?	At the beginning	22	15,3
	At the end	122	84,7
5. How long do mealtimes take for your child (in minutes)?	1-30 mins	139	96,5
	31->60 mins	5	3,5
6. How does your child behave during mealtimes?	Behaves well	133	92,4
	Acts up, makes a big fuss	11	7,6
7. Does your child gag or spit or vomit with certain types of food?	Never	126	87,5
	Most of the time	18	12,5
8. Does your child hold food in his/her mouth without swallowing?	Most of the time	9	6,2
	Never	135	93,8
9. Do you have to follow your child around or use distractions (toys, television) so that your child will eat?	Never	120	83,3
	Most of the time	24	16,7

10. Do you have to force your child to eat or drink?	Most of the time	13	9
	Never	131	91
11. How are your child's chewing (or sucking) abilities?	Good	134	93,1
	Very poor	10	6,9
12. How do you find your child's growth?	Growing poorly	3	2,1
	Growing well	141	97,9
13. How does your child's feeding influence your relationship with him/her?	Very negatively	4	2,8
	Not at all	140	97,2
14. How does your child's feeding influence your family relationship?	Not at all	142	98,6
	Very negatively	2	1,4

Results from the PEDS indicated that 47 (28,5%) infants failed (path A-D) the developmental assessment. It was further shown that 58 (40,3%) infants failed the PEDS-DM. The final outcome of the PEDS tools indicated that 58 (40,3%) infants failed the developmental screening. The distribution of the participants according to responses given in the PEDS and PEDS-DM are shown in Table 4 and 5.

Table 4: Developmental domain-specific caregiver concerns according to PEDS

	Indicating "Yes" to concerns for PEDS area	
PEDS area	**N=144**	**%**
Expressive language and articulation	6	4,2
Receptive language	5	3.5
Fine motor	2	1,4

Gross motor	0	0
Behavior	1	0,7
Social-emotional	3	2,1
Self-help	1	0,7
School	5	3,5

Table 5: Developmental domain specific 'fail' outcomes according to PEDS-DM

PEDS-DM area	**N=144**	**%**
Expressive language	11	7,6
Receptive language	1	0,7
Fine Motor	21	14,6
Gross motor	10	7
Social-emotional	14	9,7
Self-help	12	8,3

Infants that were breastfed (ø = .013; p = .010) and received both colostrum (ø = .022; p = .020) and breastmilk (ø = .009; p = .012) showed a significant association with developmentally-appropriate receptive language and self-help outcomes on the PEDS and PEDS-DM, respectively. A decrease in the age of solid food introduction led to a higher possibility of failed fine motor outcome (p = .015) on the PEDS-DM. The younger the infant at age of cup drinking introduction, the stronger the association with possible expressive language and articulation concerns (p = .030) on the PEDS. A longer breastfeeding duration was strongly correlated with failed self-help outcomes (p = .009). Conversely, a longer breastfeeding duration was associated with developmentally-appropriate expressive language skills (p = .026) on the PEDS-DM. The results further indicated that the longer the

participants were bottle-fed, the higher the likelihood of parental concern for school performance in the future (p = .039) and failed self-help outcomes (p = .004) on the PEDS-DM. In addition to this, longer durations of bottle-feeding (p = .043) and an increase in the number of spoons used per meal (p = .022) led to an increased likelihood of participants being closer to Path A on the PEDS (i.e. a fail and subsequent referral to PEDS-DM).

The spearman's rho indicated that possible behavioral (p = .007), social-emotional (p = .001), expressive language and articulation (p = .033), and future school performance (p = .001) concerns on the PEDS, as well as failed self-help outcomes (p = .036) on the PEDS-DM, were significantly associated with higher MCH-FS raw scores. Higher MCH-FS scores are indicative of an increased likelihood of presenting with feeding difficulties according to the MCH-FS. Furthermore, a negative correlation between the MCH-FS raw score and the PEDS pathway (p = .001) revealed that the higher the MCH-FS raw score was, the more likely the participant was closer to Path A on the PEDS. Item specific results from the MCH-FS revealed that food refusal at the beginning of meals was associated with fine motor (p = .013) and social-emotional (p =.005) concerns on the PEDS. Acting up and making a big fuss during mealtimes correlated with gross motor (p = .001) and behavioral (p = .034) concerns, while the use of distractions (i.e. toys or television) during mealtimes correlated with social-emotional concerns (p = .011) on the PEDS. The presence of gagging, spitting or vomiting showed an association with behavioral (p =.001) and social-emotional concerns (p = .001), as well as concerns for future school performance (p = .001) on the PEDS, and failed expressive language (p = .026) and gross motor (p = .038) outcomes on the PEDS-DM. A relationship between pocketing or holding food in the mouth, and behavioral (p = .013) and social-emotional (p = .023) concerns on the PEDS and failed fine motor outcomes (p = .038) on the PEDS-DM, was

also revealed. Force feeding and poor sucking and chewing abilities were associated with behavioral (p = .001; p = .022) and social-emotional (p = .001; p = .001) concerns, as well as concern for future school performance (p = .019; p = .001), respectively.

DISCUSSION

Although only 4,9% of infants were referred on the feeding screening, it was evident that caregiver concern for developmental outcomes were significantly higher (40,3%). This is noteworthy as both are based on caregiver report (Ramsay et al., 2011; Van der Linde, Swanepoel, Glascoe, Louw, & Vinck, 2015). The discrepancy between caregiver report of feeding and developmental outcomes may be due to the non-specificity and heterogeneity of red flags in early feeding development leading to misinterpretation by caregivers (Estrem et al., 2017).

It was found that developmentally-appropriate receptive language and self-help outcomes were significantly associated with infants that were breastfed (ø = .013; p = .010) and given both colostrum (ø = .022; p = .020) and breastmilk (ø = .009; p = .012). Our findings further suggested that breastfeeding for more than six months may be associated with developmentally-appropriate expressive language skills (p = .026). Evidence supports this finding as breastfeeding for more than twelve months may be associated with developmentally-appropriate language and cognitive skills (Iqbal, Rafique, & Ali, 2018). Conversely, poor self-help outcomes (p = .009) were associated with infants breastfeeding for a longer period. Research indicates that attachment security plays a role in the infants' ability to request help or independently interact with their environment (Rispoli, McGoey, Koziol, & Schreiber, 2013). However, it has also been established that breastfeeding does not reduce

infants' temperamental dependency or level of clinginess, which may account for poor self-help outcomes experienced by infants who were breastfed for more than six months (Gibbs, Forste, & Lybbert, 2018).

Results revealed that early introduction of solid foods may be associated with poor fine motor outcomes ($p = .015$). Early introduction of cup feeding was also found to be a predictor of possible expressive language and articulation difficulties ($p = .030$). These associations may be related to the unique progression of oral function during transitional feeding (Borowitz & Borowitz, 2018). There is a close relationship between motor development and oral feeding ability (Delaney & Arvedson, 2008). Sufficient fine motor control, occurring between five and six months of age, is required for picking up food by hand or with a spoon in order to meet transitional feeding milestones (Borowitz & Borowitz, 2018). Furthermore, there is preliminary evidence supporting the simultaneous development of speech and feeding skills where a deficit in one area, results in deficits in the other (Dent, 2018). In the current study, 29,9% of the participants commenced with cup feeding between six and eight months; but, it is not until 11 months of age where an infant is able to drink from a cup independently and efficiently (Borowitz & Borowitz, 2018). The immaturity of the oral-feeding mechanism during early cup introduction may explain the associated expressive language and articulation concerns in this population.

The findings suggest that a longer duration of bottle-feeding is linked to poor self-help outcomes ($p = .004$) and concern for future school performance ($p = .039$). In addition to this, longer durations of bottle-feeding ($p = .043$) as well as an increase in the number of spoons used per meal ($p = .022$) may be associated with poor developmental outcomes. It is

established that poor mother-infant attachment is correlated with suboptimal developmental outcomes (Branjerdporn, Meredith, Strong, & Garcia, 2017). It may be possible that due to the prolonged duration of bottle-feeding, these infants were not able to bond optimally with their caregiver and benefit from the developmental gains associated with this (Iqbal et al., 2018). To our knowledge, there is no evidence linking the duration of bottle or spoon feeding to poor developmental outcomes. These preliminary findings may offer insight into the importance of feeding practices in early and late infancy and their influence on development (Iannotti et al., 2016).

There were significant correlations between acting up ($p = .034$), gagging, spitting, or vomiting ($p = .001$), pocketing ($p = .013$), the use of force feeding ($p = .001$), and poor sucking and chewing abilities ($p = .022$) with behavioral difficulties in this sample. The relationships between feeding and behavioral characteristics may be typical of this population transitioning from a liquid to solid diet (Kerzner et al., 2015). Mealtimes become structured around allowing the infant to explore safely and finding a balance between autonomy and dependency (Delaney & Arvedson, 2008). Poor behavior may prompt inappropriate feeding strategies, aggravating behavioral issues and causing a long-term problem (Kerzner et al., 2015).

An explanation for the strong relationship between social-emotional difficulties and food refusal ($p = .005$), the use of distractions ($p = .011$), poor sucking and chewing ($p = .001$), gagging, spitting, or vomiting ($p = .001$), pocketing ($p = .023$), and force feeding ($p = .001$) during mealtimes, may be related to the misinterpretation of typical feeding development (Kerzner et al., 2015). As infants exert more control over their environment, caregivers may

misinterpret these feeding characteristics as caused by possible social-emotional difficulties whereas these behaviors may be typical of the six to twelve-month population (Delaney & Arvedson, 2008).

A relationship between fine motor difficulties and food refusal at the beginning of meals ($p = .013$) and pocketing ($p = .038$), and gross motor difficulties with acting up ($p = .001$) and gagging, spitting, or vomiting ($p = .038$) was found. The following explanations for these relationships are only speculative. Sensory over-reactions (such as gagging, spitting, or vomiting) occur as sensory tolerances emerge and align with the development of oral motor skills (Van den Engel-Hoek, Van Hulst, Van Gerven, & Van Haaften, 2014). The presence of such a maladaptive mealtime cycle may indicate transactional development between the caregiver and infant, negatively impacting the infant's development (Estrem et al., 2017; Guralnick, 2013). Conversely, poor infant development such as delayed fine or gross motor skills may create a maladaptive mealtime cycle, continuing this negative pattern (Crapnell et al., 2015). Another possible explanation may be that these feeding characteristics are suggestive of a relationship between transitional feeding and neuro-motor maturity (Delaney & Arvedson, 2008). Further research in the typical population is needed in this regard.

A significant association between food transition difficulties and failed expressive language outcomes ($p = .026$) and an increased concern for future school performance ($p = .001$; $p = .019$; $p = .001$) were shown. A previous study found that children with a language impairment had a history of food selectivity and food transition difficulties (Malas et al., 2017). This association may be due to food transition difficulties negatively influencing parent-infant

interactions with a cascading effect on language development and cognitive competence (Guralnick, 2013; Malas et al., 2017).

CONCLUSION

This study found significant associations between certain feeding characteristics and the developmental outcomes in infants aged six to twelve months in an underserved community in South Africa. The findings suggest that breastfeeding may be a protective factor for language development and adaptability in this population. Further research is necessary. In LMIC where healthcare services are overburdened, caregivers become the agents of change for their infants (Samuels et al., 2012). The results of this study may be used to advocate for the education of caregivers and for the provision of EI services in resource-limited settings. Caregivers may benefit from education on the identification of behavioral red flags regarding their infant's feeding so that they may contrast these with typical development. Clinicians in primary health care may use these findings to provide parent guidance and developmental surveillance regarding normal feeding development during infancy so that caregivers are able to differentiate between typical development and developmental concerns. This would strengthen primary preventative strategies in order to compensate for prevalent risk factors present in LMIC and improve monitoring of feeding and developmental outcomes to relieve the strain on overburdened EI services.

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CHAPTER 4

DISCUSSION AND CONCLUSION

Chapter aim and outline

This chapter provides an in-depth discussion of the current study's findings as well as theoretical and clinical implications of these findings. A critical evaluation of the strengths and limitations of the study follows, with recommendations for future research and the conclusion ending the chapter.

4.1. Critical discussion of the research results and contributions of the study

4.1.1. Outcomes of feeding and developmental screening based on caregiver report

Although only seven infants (4,9%) were referred on the feeding screening, it was evident that referral for developmental outcomes were higher with 58 infants (40,3%) failing the developmental screening. The higher number of infants failing the developmental screening may be due to infants being at an increased risk for developmental delay as a result of prevalent environmental risk factors in South Africa (Black et al., 2016). Therefore, a common framework such as the DSA or the International Classification of Functioning, Disability and Health for Children and Youth (ICF-CY) should be used to view these infants, their families and their environment holistically (Guralnick, 2011; WHO, 2007). High referral rates, based on caregiver report, may also be due to caregivers lacking awareness of developmental milestones in early childhood. A recent study found that low levels of caregiver knowledge on infant development were correlated with poor infant developmental outcomes (Yue et al., 2017). Increasing caregiver knowledge on typical feeding and developmental milestones may result in improved screening and monitoring as caregivers would discuss their concerns during PHC visits (Raspa et al., 2015). Future research studies should investigate caregiver awareness in PHC further.

A lower fail rate of the feeding screening may be related to the non-specificity and heterogeneity of red flags in early feeding development leading to misinterpretation by caregivers (Estrem et al., 2017). Caregivers may, for example, view certain behaviours (e.g. food refusal) as characteristic of typical feeding development, while others may view this as a feeding difficulty. It is therefore evident that SLTs and other primary health care clinicians should improve caregiver awareness of age-appropriate feeding and developmental characteristics so that they may identify difficulties when they are present (Raspa et al., 2015). Furthermore, SLTs require insight into caregiver perceptions of daily feeding experiences in order to interpret caregiver-reported screening findings appropriately (Estrem et al., 2016). A screening tool based on caregiver report may therefore not be ideal unless the SLT possesses insight into caregiver concern.

4.1.2. The role of breastfeeding

It was discovered that developmentally-appropriate receptive language and self-help outcomes were significantly associated with infants that were breastfed (ø = .013; p = .010) and given both colostrum (ø = .022; p = .020) and breastmilk (ø = .009; p = .012). The findings further suggested that breastfeeding for more than six months may be associated with developmentally-appropriate expressive language skills (p = .026). Conversely, poor self-help outcomes (p = .009) were associated with infants breastfeeding for a longer period. Research indicates that attachment security plays a role in the infant's ability to request help or independently interact with their environment (Rispoli et al., 2013). However, it has also been established that breastfeeding does not reduce infants' temperamental dependency or level of clinginess, possibly accounting for poor self-help outcomes experienced by infants who were breastfed for more than six months (Gibbs, Forste, & Lybbert, 2018). Furthermore, there is evidence suggesting that breastfeeding for more than twelve months may be associated with developmentally-appropriate language and cognitive skills (Iqbal, Rafique, & Ali, 2018). The findings reveal that breastfeeding may act as a protective factor for language and adaptability in infants in LMIC. Further research about the influence of breastfeeding on other language domains is warranted.

These findings are valuable as breastfeeding may reduce the negative influence of environmental risks on infant development (Guralnick, 2013). According to the WHO (2003),

infants should be exclusively breastfed for the first six months of life with the addition of nutritionally adequate and safe complementary feeding from six months of age. However, only 31,6% of infants under the age of six months are exclusively breastfed in South Africa (Statistics South Africa, 2017b). In addition to this, approximately 25% of infants under the age of six months are not breastfeeding at all (Statistics South Africa, 2017b). Interventions both prenatally and postnatally have shown to promote exclusive breastfeeding until six months of age and beyond (Kim, Park, Oh, Kim, & Ahn, 2018). It is therefore evident that pregnant and lactating mothers require strengthened individualized feeding counselling at various contact points during antenatal and postnatal clinic visits in PHC (Horwood et al., 2018). Thus, initiatives such as the Baby-friendly Hospital Initiative (BFHI) (WHO & UNICEF, 2009) should be promoted by EI healthcare professionals in LMIC. The BFHI has recently been updated to guide the implementation of this initiative in PHC contexts as it has shown to have the greatest effect among exclusive breastfeeding promotion interventions (Kim et al., 2018). Table 6 shows the updated BFHI (WHO & UNICEF, 2018) with the proposed role of the SLT. SLTs should advocate for the implementation of such an initiative at a local and national level as breastfeeding may support the development of infant resilience in the presence of environmental stressors (ASHA, 2008; Guralnick, 2011).

Table 6: Ten steps to successful breastfeeding (revised 2018) (Compiled from WHO & UNICEF, 2018)

CRITICAL MANAGEMENT PROCEDURES	ROLE OF SLT
1a. Comply fully with the *International Code of Marketing of Breast-milk Substitutes* and relevant World Health Assembly resolutions.	Provide brochures to nursing staff, other healthcare professionals, and families to promote the use of breastmilk and its associated benefits for language development.
b. Have a written infant feeding policy that is routinely communicated to staff and parents.	Become familiar with the infant feeding policy in order to maintain consistent application of this when providing EI services.
c. Establish ongoing monitoring and data-management systems.	Participate in ongoing monitoring strategies such as acquiring feedback from caregivers through verbal feedback or questionnaires.
2. Ensure that staff have sufficient knowledge, competence and skills to support breastfeeding.	Attend staff meetings every six months to participate in reviewing and providing feedback on the implementation of the BFHI.

Table 6: Continued…

KEY CLINICAL PRACTICES	ROLE OF SLT
3. Discuss the importance and management of breastfeeding with pregnant women and their families.	Support nurses and other PHC staff that are presenting prenatal classes to caregivers to share information about the benefits of breastfeeding for attachment, caregiver-infant interaction, and communication development.
4. Facilitate immediate and uninterrupted skin-to-skin contact and support mothers to initiate breastfeeding as soon as possible after birth.	Promote skin-to-skin contact by educating caregivers on the benefits for attachment, caregiver-interaction, and communication development.
5. Support mothers to initiate and maintain breastfeeding and manage common difficulties.	Provide brochures to caregivers illustrating common breastfeeding difficulties and where to find assistance at the PHC so that they may seek support if unable to manage these independently.
6. Do not provide breastfed newborns any food or fluids other than breast milk, unless medically indicated.	Educate caregivers on the importance of exclusive breastfeeding during parent support groups.
7. Enable mothers and their infants to remain together and to practice rooming-in 24 hours a day.	Provide practical guidance on positioning strategies during pre- and postnatal classes to support caregivers during the first days of their infant's life.
8. Support mothers to recognize and respond to their infants' cues for feeding.	Contribute to the compilation of educational brochures that may be distributed to caregivers in PHC to illustrate how to respond to an infant's behavioural cues for feeding and indicate how this would help build a nurturing relationship between caregiver and infant.
9. Counsel mothers on the use and risks of feeding bottles, teats and pacifiers.	Promote exclusive breastfeeding for at least six months and continued breastfeeding with the use of appropriate complimentary feeding beyond six months through the use of brochures, training of PHC staff and parent guidance sessions.
10. Coordinate discharge so that parents and their infants have timely access to ongoing support and care.	Educate caregivers and PHC staff on the role of the SLT, i.e. to identify, assess and manage sucking and swallowing difficulties, so that they may seek support and request a referral to a SLT if they have concerns.

4.1.3. Expectations during typical feeding development

It was revealed that the early introduction of solid foods may be associated with poor fine motor outcomes (p = .015). The early introduction of cup feeding was also found to be a possible predictor of expressive language and articulation difficulties (p = .030). These associations may be related to the unique progression of oral function during transitional feeding (Borowitz & Borowitz, 2018). There is a close relationship between motor development and oral feeding ability (Delaney & Arvedson, 2008). Sufficient fine motor control, occurring between five and six months of age, is required for picking up food by hand or with a spoon in order to meet transitional feeding milestones (Borowitz & Borowitz, 2018). Furthermore, there is preliminary evidence supporting the simultaneous development of speech and feeding skills where a deficit in one area, results in deficits in the other (Dent, 2018). In the current study, 29,9% of the participants initiated cup feeding between six and eight months; however, it is not until 11 months of age where an infant is able to drink from a cup independently and efficiently (Borowitz & Borowitz, 2018). The immaturity of the oral-feeding mechanism during early cup introduction may explain the associated expressive language and articulation difficulties in this population.

The findings further suggested that a longer duration of bottle-feeding may be linked to poor self-help outcomes (p = .004) and caregiver concern for future school performance (p = .039). In addition to this finding, longer durations of bottle-feeding (p = .043) as well as an increase in the number of spoons used per meal (p = .022) may be associated with poor developmental outcomes. Infants with neuromuscular and developmental disorders (such as cerebral palsy) often experience longer feeding times as a result of structural abnormalities, motor delay or a sensory component to the feeding difficulty (Borowitz & Borowitz, 2018). However, to our knowledge, there is no evidence linking the duration of feeding times to poor developmental outcomes in the typical population. Furthermore, it has been established that poor mother-infant attachment is correlated with suboptimal developmental outcomes (Branjerdporn et al., 2017). It may be possible that due to the prolonged duration of bottle-feeding, these infants were not able to build a bond with their caregiver and benefit from the developmental gains associated with this (Iqbal et al., 2018). These findings may only be speculated as further research is warranted.

Similar to a previous study (Iannotti et al., 2016), the current study's findings may offer insight into the importance of feeding practices in early and late infancy and their influence on developmental outcomes. These findings are invaluable to the SLT providing primary prevention in LMIC as it develops insight into the feeding practices that may be detrimental to a population already at an increased risk for feeding and developmental difficulties due to prevalent environmental risk factors. SLTs, nurses, and dieticians would benefit from joint professional development that enhances their knowledge and skills in order to provide comprehensive and coordinated services to this population (ASHA, 2008). This would ensure that these EI healthcare professionals use the same knowledge base and similar approaches to avoid fragmentation of services. Consequently, caregivers would be educated on the most beneficial feeding practices that are individualized to prevent poor fine motor outcomes and expressive language and articulation difficulties in this population. Our findings provided additional evidence for the promotion of breastfeeding and the developmental benefits associated with mother-infant attachment.

It is apparent that the implementation of feeding and developmental screening and surveillance tools should be prioritized in South Africa. The use of an mHealth tool may be a feasible method of implementation in this regard (Maleka et al., 2016). mHealth is a smartphone-based method of delivering health services to communities (Maleka et al., 2016). Pairing an mHealth feeding and developmental screening tool with community health workers is a low-cost option for decentralized access to early detection services (Van der Merwe, Mosca, Swanepoel, Glascoe, & Van der Linde, 2018). Through the use of a transdisciplinary model, community health workers may be trained by SLTs and other PHC professionals in using mHealth tools to provide comprehensive, integrated and informed health services to underserved communities (Maleka et al., 2016). This community-oriented method of care would reduce the burden on PHC clinicians and resources as well as ensure that EI services are family-centered, culturally-responsive, and coordinated (ASHA, 2008; Maleka et al., 2016). Primary, secondary and tertiary preventive strategies would subsequently be strengthened as community health workers act as a point of entry for underserved communities into the healthcare system (Kinkel, Marcus, Memon, Bam, & Hugo, 2013). SLTs should therefore participate in advocacy activities to implement these changes at a national level in South Africa.

4.1.4. The relationship between transitional feeding and infant development

There were significant correlations between acting up (p = .034), gagging, spitting, or vomiting (p = .001), pocketing (p = .013), the use of force feeding (p = .001), and poor sucking and chewing abilities (p = .022) with behavioural difficulties in the sample. The relations between feeding characteristics and behavioural outcomes may be typical of a population transitioning from a liquid to solid diet (Kerzner et al., 2015). Mealtimes during late infancy become structured around allowing the infant to explore safely and finding a balance between autonomy and dependency (Delaney & Arvedson, 2008). Poor behaviour may prompt inappropriate feeding strategies, aggravating behavioural issues and causing a long-term problem (Kerzner et al., 2015).

A strong relationship between social-emotional difficulties and food refusal (p = .005), the use of distractions (p = .011), poor sucking and chewing (p = .001), gagging, spitting, or vomiting (p = .001), pocketing (p = .023), and force feeding (p = .001) during mealtimes was found. These findings may be related to the typical pattern of infant behavioural development. An infant's behavioural development at six to thirty-six months of age consists of a struggle to attain a sense of self during the separation/individuation period (Delaney & Arvedson, 2008). As these infants exert more control over their environment, caregivers may misinterpret these behaviours as feeding difficulties and social-emotional difficulties whereas these behaviours are typical of this population (Delaney & Arvedson, 2008).

A relationship between fine motor difficulties and food refusal at the beginning of meals (p = .013) and pocketing (p = .038), and gross motor difficulties with acting up (p = .001) and gagging, spitting, or vomiting (p = .038) was found. Explanations for these relationships may only be speculated at present. Sensory reactions (such as gagging, spitting, or vomiting) occur as sensory tolerances emerge and align with the development of oral motor skills (Van den Engel-Hoek, Van Hulst, Van Gerven, & Van Haaften, 2014). The presence of a maladaptive mealtime cycle may occur as caregivers often make feeding adaptations as a result of a feeding difficulty which subsequently influences parent-infant transactions and negatively impacts infant development (Estrem et al., 2017; Guralnick, 2013). Conversely, poor infant development such as delayed fine or gross motor skills may create a maladaptive mealtime pattern, continuing a vicious cycle (Crapnell et al., 2015). Another possible explanation may

be that these feeding characteristics are suggestive of a relation between transitional feeding and neuro-motor maturity (Delaney & Arvedson, 2008). This implies that early motor behaviours may have a predictive role in transitional feeding success and should be the focus of assessment and intervention in early infancy in EI services. However, further research in the typical developing infant population is needed in this regard.

A significant association between food transition difficulties and increased concern for expressive language outcomes (p = .026) and future school performance (p = .001; p = .019; p = .001) was found. A previous study found that children with a language impairment had a previous history of food selectivity and food transition difficulties (Malas et al., 2017). This association may be due to food transition difficulties negatively influencing parent-infant interactions with a cascading effect on language development and cognitive competence (Guralnick, 2013; Malas et al., 2017). As language is learned in the context of familiar parent-infant interactions, this association was expected (ASHA, 2008). An infant's participation in negative mealtime behaviours results in the caregiver making less dynamic attempts to engage in pleasurable interactions with their infant (Rossetti, 2001). SLTs should therefore observe mealtimes to identify behaviours that may be facilitating or impeding interaction and communication in order to refine and increase positive parent and infant behaviours (ASHA, 2008). Infants at biological or environmental risk may interact differently with their environment resulting in caregivers changing their interaction pattern (Rossetti, 2001). Caregiver education may therefore be beneficial to increase caregivers knowledge of their role in parent-infant interaction and how they may support their infants communication development (ASHA, 2008; Rossetti, 2001).

It is evident that caregivers require information regarding typical feeding development during infancy to differentiate between typical development and developmental concerns. This may be achieved through primary prevention strategies such as awareness programs and antenatal support groups where clinicians have direct contact with caregivers (ASHA, 2008). Families provide lifelong contexts for development – especially for communication development (ASHA, 2008). SLTs therefore play a crucial role in ensuring infants are able to actively explore their environments, manipulate objects, and share authentic experiences with their caregivers (ASHA, 2008). Furthermore, SLTs possess specialized knowledge in

assessing and treating feeding and swallowing disorders, abnormal physiology related to swallowing function, and knowledge of medical issues related to feeding and swallowing (ASHA, 2002; ASHA, 2008). They form part of the EI team often consisting of occupational therapists, dieticians, and nursing staff whose focus is feeding independence, nutrition, appropriate growth and weight gain (Borowitz & Borowitz, 2018). There are many overlapping roles in the EI team; however, SLTs play a primary role in feeding and swallowing disorders (ASHA, 2008). SLTs thus assume important consultant and collaboration functions with the feeding team, including the caregivers themselves (ASHA, 2008). If caregivers are able to contrast typical feeding behaviours with problematic behaviours, they may be able to seek support from SLTs when necessary. This would lead to decreased caregiver stress and more fulfilling parent-infant interactions during mealtimes and play, establishing resilience and protection from other environmental risks (Guralnick, 2013). SLTs should therefore use the DSA (Guralnick, 2005) as a framework to identify components within family patterns of interaction in order to set explicit goals to support infant feeding and developmental outcomes. However, this may not be feasible as developmental screening is not required by law in South Africa (Samuels et al., 2012). A model illustrating a process of implementation of the DSA and levels of prevention in PHC is suggested in order to advocate for a change in national policy. A model was conceptualized according to the current study's implications and is discussed in Table 7.

4.2. **Critical evaluation**

4.2.1. Theoretical implications of the study

The current study has shown that feeding and developmental difficulties may be related in late infancy. The focus in literature, however, remains on populations with complex medical conditions (Malas et al., 2017; Pascal et al., 2018; Zimmerman, 2018). SLTs may have a gap in knowledge concerning feeding and developmental difficulties in typically-developing infants, prompting the tendency to overlook this population (Svystun et al., 2017). Additionally, SLTs working in PHC in South Africa are overburdened with large caseloads resulting in the inability to fulfil their scope of practice in EI, focusing only on cases of severe feeding and developmental disorders (Van der Linde & Kritzinger, 2013). To add to the complexity of the situation, typical development is variable and influenced by many environmental factors

(Anderson & Burnett, 2017; Richter et al., 2017). The training of SLTs previously focused primarily on the medical model, which does not take environmental factors into consideration when formulating intervention goals (Samuels et al., 2012). This inevitably leads to the maintenance of environmental risks and the exacerbation of developmental and feeding difficulties until long term consequences are evident (Samuels et al., 2012).

The current study therefore advocates for SLTs to be trained to use the DSA (Guralnick, 2005) to increase the awareness of the role of environmental factors on infants' developmental progression. Furthermore, SLTs should be trained in community-based rehabilitation during undergraduate studies so that primary preventive strategies are initiated timeously in underserved communities where environmental risks are prevalent (Samuels et al., 2012). The findings additionally indicated that the awareness of typical feeding development should be raised among caregivers so that this may be contrasted with developmental concerns. This is vital in a context such as South Africa where EI services are overburdened as a result of a limited number of healthcare professionals, resources and facilities in the public sector (Samuels et al., 2012). This is not only the role of the SLT, but also the role of the PHC nursing staff and dieticians.

In order to further decrease the burden on EI services in South Africa, SLTs should be trained to use a transdisciplinary approach when working in PHC with dieticians, occupational therapists and nurses (ASHA, 2008; Samuels et al., 2012). This approach would allow for role-release and joint professional development so that services are not fragmented and focused on disability and discipline-specific goals, but rather on the infant and their environment (ASHA, 2008). Consequently, SLTs (the primary team member in the case of oropharyngeal dysphagia) may be able to participate in role release with other professionals working with affected infants (i.e. nurses, occupational therapists, physiotherapists, and dieticians) (ASHA, 2008). Role extension is another benefit of the transdisciplinary approach, increasing SLTs' knowledge base so that services are not only focused on SLT goals, but also on other healthcare professionals' goals in order to provide holistic management in line with international guidelines for EI (ASHA, 2008).

4.2.2. Clinical implications of the study

The current study revealed that caregiver report may be a valuable method in determining an infant's eligibility for EI services for feeding and developmental difficulties should the clinician be able to interpret caregiver concern correctly. Caregiver report may be underestimated in a context where the efficiency of screening services may be improved to reduce the burden on PHC. For example, the current study's findings about early feeding practices and how these influence developmental outcomes (i.e. fine motor and expressive language and articulation difficulties) may be shared by the EI team with caregivers during information sessions to prevent future developmental difficulties. The use of a transdisciplinary approach would therefore be favourable in providing coordinated, comprehensive and team-based EI services in PHC in South Africa (ASHA, 2008). SLTs should work together with nurses, dieticians, and occupational therapists to equip caregivers to identify behavioural red flags in feeding development so that they may contrast these with typical development and seek EI services timeously.

As this study's findings demonstrated a significant correlation between feeding and developmental difficulties, both feeding and developmental screening in late infancy should be prioritized. The challenge for the typically-developing infant population is that developmental screening is not required by law in South Africa (Samuels et al., 2012). Furthermore, the nationally-implemented developmental screening tool in the Road to Health Booklet (RTHB) is inaccurate and fails to identify more than half of infants at risk of developmental delay (Van der Linde et al., 2015). Even if infants passed the developmental screening, there are no coordinated developmental monitoring and surveillance systems in place in South Africa (Samuels et al., 2012). The American Speech-Language-Hearing Association (2008), states that SLTs should participate in advocacy activities for EI services. The current study thus provides strong evidence for the involvement of the SLT in national efforts to change public policy on feeding and developmental screening, monitoring, and surveillance systems (ASHA, 2008). Infants at risk of feeding and developmental difficulties as a result of exposure to environmental risks should receive comprehensive screening services during immunization visits at six, nine, and twelve months of age (National Institute for Communicable Diseases, 2016). The RTHB was intended for this purpose, but it falls short (Van der Linde et al., 2015).

The inclusion of developmental screening in PHC would create the opportunity for other preventive strategies to occur (Van der Linde, Kritzinger, & Redelinghuys, 2009). The SLT is uniquely qualified to provide information about feeding, swallowing, and communication difficulties and consult with family members and other healthcare professionals in the EI team (ASHA, 2008). SLTs may participate in primary prevention strategies such as monthly group information sessions while caregivers are waiting at well-baby immunization clinics. Information about communication and feeding or swallowing disorders should be shared with caregivers during these sessions. By providing caregiver training on topical areas (such as communication-interaction with infants) during these group sessions, caregivers may be able to identify areas of concern and raise these concerns with nursing staff or other EI healthcare professionals. Once infants are identified for further evaluation, the SLT and other EI team members may then provide comprehensive services to assist in assessing and intervening appropriately to prevent further secondary complications (ASHA, 2008). The current study therefore highlights the importance of the provision of primary prevention strategies and how these may have a cumulative effect in ameliorating environmental risks in LMIC such as South Africa (ASHA, 2008).

Table 7 presents a model that illustrates a process of implementation of the DSA and levels of prevention in PHC in South Africa. The model was conceptualised according to the implications that arises from the current study.

Table 7: Implementation of the levels of prevention in PHC in South Africa according to the DSA

		LEVELS OF PREVENTION		
		Primary	**Secondary**	**Tertiary***
DEVELOPMENTAL SYSTEMS APPROACH	**Child social and cognitive competence**	Transdisciplinary awareness programs: • Feeding and developmental characteristics in late infancy. • Infant feeding and developmental milestones. • Feeding practices in early and late infancy. Transdisciplinary team approach for the promotion of breastfeeding: • Advocacy for the implementation of the BFHI. • Benefits of breastmilk and colostrum for language development.	SLTs should participate in national advocacy efforts to change public policy for: • Developmental and feeding screening during immunization visits at six, nine, and twelve months. • Developmental monitoring and surveillance. Implementation of: • Developmental and feeding screening. • Developmental and feeding monitoring and surveillance. EI services for: • Feeding and developmental difficulties.	Clinical and instrumental assessment • Once feeding, swallowing, and communication difficulties are identified. Intervention and appropriate referral to specialist services if required, i.e. paediatric neurology, paediatric gastro-enterology • For feeding, swallowing, and communication disorders.
	Family patterns of interaction	Transdisciplinary awareness programs: • Caregiver's role in parent-infant interaction during mealtimes. • Benefits of caregiver-infant interaction. • Providing a stimulating environment for appropriate developmental outcomes.	Observation of: • Caregiver-infant interaction during mealtimes to identify and manage maladaptive behaviours.	Monitoring of: • Maladaptive caregiver and infant behaviour. Management and appropriate referral for intervention of: • Maladaptive caregiver-infant interactions during mealtimes.
	Family resources	Access to: • Antenatal care. • Support groups. • Individualized infant feeding counselling and guidance. Provide information on: • The role of the SLT in EI. • PHC clinics and services offered. • Access to community health workers.	After referral: • EI healthcare professionals should ensure timeous access to EI services. EI programs such as: • Stimulation packs to increase caregiver competence.	Community-based rehabilitation strategies: • Identify communities lacking access to EI services. • Monitor implementation of EI services. • Manage implementation difficulties.

*Compiled from Guralnick (2005) based on current study's findings. * Recommended for future research*

This model provides evidence for the involvement of SLTs and other EI healthcare professionals in national efforts to change public policy on developmental and feeding screening, monitoring, and surveillance. Various feasible methods for developmental and feeding screening, monitoring, and surveillance may be considered to reduce the burden on PHC. The use of mHealth tools by community health workers may, for example, improve universal access to these services and result in early and accurate referral to EI healthcare professionals in PHC (Maleka et al., 2016; Van der Merwe et al., 2018). The provision of a national developmental screening tool would further strengthen primary preventive strategies with subsequent influences on the implementation of secondary and tertiary preventive strategies in PHC in South Africa. It is therefore evident that advocacy efforts to change public policy on developmental and feeding screening, monitoring, and surveillance during the early childhood years should be prioritized in South Africa.

4.3. Strengths and limitations

4.3.1. Strengths of the study

The retrospective design of the study allowed for the analysis of a large sample previously collected (Neuman, 2014). The focus on the typical infant population reduced the SLT and other healthcare professionals' gap in knowledge about feeding and developmental difficulties, adding value to the research and clinical community (Bhattacharyya, 2015). Furthermore, the use of feeding and developmental screening and assessment tools that were based on caregiver report allowed for a preliminary investigation of caregiver knowledge in an underserved community. These screening and assessment tools are supported by research in terms of validity and reliability, strengthening the findings of this study. The findings are motivating for SLTs and other healthcare professionals to focus on the provision of education and consultation with all team members in EI services in South Africa (ASHA, 2008; Samuels et al., 2012).

4.3.2. Limitations of the study

Although the current study revealed significant findings, many limitations were noted. A clinical feeding assessment was included (SOMA); however, the SOMA's results could not be analysed as a small number of infants (n=7) in the sample were referred for an in-depth

assessment. Thus, the retrospective design may have limited the current study's ability to investigate correlations between clinical assessment and caregiver report. Additionally, the use of screening tools rather than clinical assessment tools limited the analysis of diagnostic data. Another limitation was the issue of missing data. Initially the current study had 250 infants, but following the removal of incomplete data, 144 participants remained.

4.4. Recommendations for future research

The current study revealed preliminary evidence of the importance of feeding practices in early and late infancy and their relationship with developmental outcomes. Further investigations are required in order to provide caregivers with evidence-based information to support their decision-making during the transitional feeding process. It was discovered that infants that were breastfed, given breastmilk and colostrum, and were breastfeeding for six months had developmentally-appropriate receptive and expressive language outcomes. The interrelationship between feeding and communication development is complex and requires continuous research (Delaney & Arvedson, 2008). Future studies should therefore investigate the influence of breastfeeding on other language domains in early and late infancy. It is further recommended that future studies investigate caregiver knowledge and perceptions of transitional feeding in order to examine how this may influence infant development. This would additionally create a baseline of what caregivers know about this process in order to guide SLTs and other healthcare professionals on which areas to target in underserved communities when implementing primary preventive strategies (ASHA, 2008). An investigation into prevention strategies and the role of the EI team in PHC should also be explored in order to identify the roles, perceptions, and knowledge of EI healthcare professionals. This would allow for the expansion of current prevention structures in PHC to become more comprehensive, coordinated and team-based. The use of a prospective research design with a larger sample is additionally recommended to strengthen the current study's findings. Furthermore, future studies should consider the use of clinically-validated diagnostic feeding and developmental assessment tools to comprehensively investigate the relationship between feeding and developmental outcomes in late infancy.

4.5. Conclusion

This study demonstrates a significant association between certain feeding characteristics and developmental outcomes in infants aged six to twelve months in one underserved community in South Africa. Interestingly, the relationship between feeding practices and developmental outcomes in early and late infancy were identified as areas requiring further attention in research. Correlations between the early introduction of solids and cup feeding with concern for fine motor and expressive language and articulation difficulties were evident. Furthermore, the findings demonstrated a relationship between the length of feeding and developmental outcomes. However, further investigations into this relationship is warranted. Compelling evidence about breastfeeding acting as a possible protective factor for language development in this population was also found. Further research is recommended in this regard.

Although the current study was reliant on caregiver report, significant implications for theoretical and clinical practice were identified. In a context where healthcare services are overburdened, caregivers become the agents of change for their infants (Samuels et al., 2012). Thus, caregivers require support, education and empowerment in identifying behavioural red flags in their infants' feeding development so that they may contrast these concerns against typical development. Further guidance regarding typical feeding development during infancy is necessary so that caregivers are able to differentiate between typical development and developmental concerns. Future research studies should investigate primary prevention structures currently in place in PHC in LMIC in order to expand on these.

Furthermore, EI team members should participate in a transdisciplinary approach to benefit from joint professional development so that EI services are no longer fragmented in PHC. The use of the DSA may assist EI healthcare professionals in achieving this as it considers an interplay of protective and risk factors at all levels of infant development (Guralnick, 2011). In addition to this, the organization and analysis of multiple healthcare professionals approaches and goals may be possible when using the DSA (Guralnick, 2011). This is in agreement with the EI guiding principles as outlined by American Speech-Language-Hearing Association (2008), which stipulate that services should be: family-centered and culturally

responsive; developmentally supportive and promote infant's participation in their natural environments; comprehensive, coordinated, and team-based; and based on the highest quality internal and external evidence that is available. The current study strongly advocates for the attainment of these principles in PHC in South Africa.

Finally, the findings provided evidence for a national change in public policy on feeding and developmental screening, surveillance, and monitoring in South Africa. The current study's findings supports the use of mHealth tools by community health workers to provide universal, comprehensive, and coordinated services to underserved communities (Van der Merwe et al., 2018). The provision of feeding and developmental screening, surveillance, and monitoring services would have subsequent influences on the implementation of other preventive strategies in PHC. A national change in public policy should therefore be prioritized by SLTs and other EI healthcare professionals working in PHC in South Africa.

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6. APPENDICES

Appendix A: Ethical Clearance letter: Faculty of Humanities Research Ethics Committee

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Humanities
Research Ethics Committee

7 March 2018

Dear Ms Eales

Project:	**Feeding and general developmental outcomes of infants in an underserved community**
Researcher:	**B Eales**
Supervisor:	**Dr J van der Linde and Ms E Krüger**
Department:	**Speech-Language Pathology and Audiology**
Reference number:	**12208672 (GW20180121HS)**

Thank you for the application that was submitted for ethical consideration. The Committee notes that is a retrospective study that involves secondary data analysis and that permission was granted by the initial researcher to use the data.

I am pleased to inform you that the above application was **approved** by the **Research Ethics Committee** at an ad hoc meeting on 7 March 2018. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

Sincerely

Prof Maxi Schoeman
Deputy Dean: Postgraduate Studies and Ethics
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail:tracey.andrew@up.ac.za

cc: Dr J van der Linde and Ms E Krüger (Supervisors)

Appendix B: Permission letter from previous researcher

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

FACULTY OF HUMANITIES
DEPARTMENT SPEECH-LANGUAGE PATHOLOGY AND AUDIOLOGY

5 March 2018

To whom it may concern,

I, Nichole Fuls, give Bronwyn Eales permission to use the data collected for the research project: *Prevalence and nature of feeding problems in infants in primary health care* (Reference number: 29070857 – GW20170112HS).

Should you require any further information, you may contact me on:

Tel: 072 929 0036

Email: nicholefuls@gmail.com

Kind regards,

Nichole Fuls

Appendix C: Background participant and family information questionnaire

QUESTIONNAIRE

Participant and family information (Van der Linde, Swanepoel, Glascoe, Louw, & Vinck, 2015).
Please answer the questions by drawing a circle around an appropriate number in a shaded box or by writing your answer in the shaded box provided.

				FOR OFFICE USE ONLY
INFANT CODE				V1
Infant information				
1. What is the date of the test series? (Please use dd/mm/yy)	DAY	MONTH	YEAR	V2
2. What is the date of birth of the infant? (Please use dd/mm/yy)	DAY	MONTH	YEAR	V3
3. What is the age of the infant?	MONTHS			V4
4. What is the gender of the infant?	1. MALE	2. FEMALE		V5
5. How many weeks premature was the infant? (Whole weeks only)	WEEKS			V6
6. Has the infant been exposed to HIV?	1. YES	2. NO		V7
7. What is the infant's current status?	1. Positive	2. Negative		V8
8. Is the infant currently receiving treatment for HIV?	1. YES	2. NO		V9
Caregiver information				
9. What is your relation to the infant?	1. MOTHER OF INFANT	2. FATHER OF INFANT		V10
	3. FAMILY MEMBER OF INFANT	4. NON-FAMILY CAREGIVER OF INFANT		
10. What is your age, as of your last birthday?	YEARS			V11
11. What is your home language? (indicate those applicable)	1. AFRIKAANS	2. ENGLISH	3. ISINDEBELE	V12
	4. ISIZULU	5. ISIXHOSA	6. SEPEDI	
	7. SESOTHO	8. SETSWANA	9. SISWATI	

	10. VENDA	11. XITSONGA	12. OTHER (SPECIFY)	
12. What other languages do you speak? (indicate those applicable)	1. AFRIKAANS	2. ENGLISH	3. ISINDEBELE	V13
	4. ISIZULU	5. ISIXHOSA	6. SEPEDI	
	7. SESOTHO	8. SETSWANA	9. SISWATI	
	10. VENDA	11. XITSONGA	12. OTHER (SPECIFY)	
13. In terms of the Employment Equity Act, to which population group do you belong?	1. BLACK	2. COLOURED	3. WHITE	V14
	4. ASIAN	5. OTHER (SPECIFY)		
14. Who is the primary caregiver of the infant?	1. MOTHER	2. FATHER	3. BOTH PARENTS	V15
	4. GRANDPARENTS	5. EXTENDED FAMILY MEMBERS	6. FOSTER PARENTS	
	7. OTHER (SPECIFY)			
15. What is the highest educational qualification of the mother of the infant?	1. I DO NOT KNOW	2. NO FORMAL SCHOOLING	3. LESS THAN GRADE 8	V16
	4. GRADE 8 TO GRADE 10	5. GRADE 11 TO GRADE 12	6. DIPLOMA/DEGREE	
	7. POSTGRADUATE			
16. What is the highest qualification of the father of the infant?	1. I DO NOT KNOW	2. NO FORMAL SCHOOLING	3. LESS THAN GRADE 8	V17
	4. GRADE 8 TO GRADE 10	5. GRADE 11 TO GRADE 12	6. DIPLOMA/DEGREE	
	7. POSTGRADUATE			
17. What is the highest qualification of the caregiver of the infant?	1. I DO NOT KNOW	2. NO FORMAL SCHOOLING	3. LESS THAN GRADE 8	V18

	4. GRADE 8 TO GRADE 10	5. GRADE 11 TO GRADE 12	6. DIPLOMA/DEGREE	
	7. POSTGRADUATE			
18. What is the average household income per month?	R			V19
19. What is the age of the infant's mother?				V20
20. How many children has the mother given birth to?				V21
21. How many children living children does the mother have?				V22
22. What is the marital status of the mother of the infant?	1. I DO NOT KNOW	2. NEVER MARRIED	3. LIVING TOGETHER	V23
	4. MARRIED (AND OR TRADITIONAL)	5. WIDOWED	6. SEPARATED	
	7. DIVORCED			
23. What is the marital status of the father of the infant?	1. I DO NOT KNOW	2. NEVER MARRIED	3. LIVING TOGETHER	V24
	4. MARRIED (AND OR TRADITIONAL)	5. WIDOWED	6. SEPARATED	
	7. DIVORCED			
24. What is the marital status of the caregiver of the infant?	1. I DO NOT KNOW	2. NEVER MARRIED	3. LIVING TOGETHER	V25
	4. MARRIED (AND OR TRADITIONAL)	5. WIDOWED	6. SEPARATED	
	7. DIVORCED			
25. What is your housing status?	1. OWN MY HOUSE	2. OWN MY FLAT	3. INFORMAL HOUSING	V26
	4. I AM RENTING	5. I STAY WITH OTHERS	6. OTHER	
	A. OWN / B. RENTING			
26. Do you make use of day-care for your infant?	1. YES		2. NO	V27
27. How many people are living in the household?				V28
28. Is the primary caregiver employed?	1. YES		2. NO	V29

Infant feeding history and development				
29. Did the infant have any neonatal feeding difficulties (first two weeks after birth)?	1. YES		2. NO	V30
30. Did the infant stay in hospital for any reason?	1. YES		2. NO	V31
	3. SPECIFY REASONS			V32
31. Did the infant receive tube feeding?	1. YES		2. NO	V33
	1. OROGASTRIC		2. NASOGASTRIC	V34
	HOW LONG?			V35
32. Was the infant breastfed?	1. YES		2. NO	V36
33. Did the infant receive colostrum? (Did they breastfeed immediately?)	1. YES		2. NO	V37
34. Did the infant receive breast milk?	1. YES		2. NO	V38
35. Was the breastmilk given via direct breastfeeding or expression?	1. DIRECT		2. EXPRESS	V39
36. If expressed, was it given via a bottle or cup?	1. BOTTLE		2. CUP	V40
37. Were there any difficulties with breastfeeding?	1. YES		2. NO	V41
38. What type of difficulties were identified?				V42
39. Was it problems with the mother's breasts? Specify.	1. PAIN	2. SWELLING	3. ENGORGEMENT	V43
	4. BLEEDING NIPPLE		5. OTHER	
40. Was it problems with the infant? Specify.	1. LATCHING ON THE BREAST		2. SUCKING ON THE BREAST	V44

	3. FALLING ASLEEP AT THE BREAST TOO SOON	4. OTHER		
41. How long has the infant been breast feeding for? (in months)	MONTHS			V45
42. What type of milk was given?				V46
43. Is the infant bottle-fed?	1. YES	2. NO		V47
44. What type of bottle is used?				V48
45. How long has the infant been bottle-fed? (in months)	MONTHS			V49
46. Other than milk, what liquid does the infant drink?				V50
47. Has the infant been introduced to a cup?	1. YES	2. NO		V51
	AT WHAT AGE?			V52
48. What consistencies/food textures does the infant ear at the moment?	1. PUREE	2. SEMI-SOLIDS	3. SOLIDS	V53 A B
	4. CRACKERS	5. LIQUIDS	6. OTHER (SPECIFY)	C D E F
49. When was solid food introduced for the first time?	MONTHS			V54
50. What was the first solid food introduced?				V55
51. Which method was used to introduce solids?	1. MOTHER'S HAND	2. SPOON	3. OTHER	V56
52. How often do you feed your infant during the day? A. Breastfeeding	1. SCHEDULED FEEDING	2. FEEDING ON DEMAND		V57 A
	3. INTERVALS OF SCHEDULED FEEDS (HOURS)	4. AMOUNT OF ON DEMAND FEEDS		B
	5. OTHER (SPECIFY)			C
B. Bottle-fed	1. SCHEDULED FEEDING	2. FEEDING ON DEMAND		V58 A
	3. INTERVALS OF SCHEDULED FEEDS (HOURS)	4. AMOUNT OF ON DEMAND FEEDS		B
	5. OTHER (SPECIFY)			C
C. Porridge (solids)	1. SCHEDULED FEEDING	2. FEEDING ON DEMAND		V59 A

				B		
	3. INTERVALS OF SCHEDULED FEEDS (HOURS)		4. AMOUNT OF ON DEMAND FEEDS			
	5. OTHER (SPECIFY)			C		
53. How much milk does your infant drink in a feeding session? (Bottle-fed)	ml			V60		
54. How long does a feeding session usually last? A. Breastfeeding B. Bottle-feeding C. Solids	1. 5 MIN	2. 10 MIN	3. 15 MIN	V61	V62	V63
	4. 20 MIN	5. 25 MIN	6. OTHER	A	B	C
55. How much porridge (solid consistency) does your child consume in a single feeding session?	TABLE SPOONS (15 ML)			V64		
56. What is the infant's current weight?	Kg			V65		
57. Is the mother/caregiver currently concerned about the infant's feeding or weight gain?	1. YES		2. NO	V66		
	3. CONCERN			V67		

Thank you for your time and cooperation!

Appendix D: Montreal Children's Hospital – Feeding Scale

THE MONTHREAL CHILDREN'S HOSPITAL FEEDING SCALE (MCH-FS)

For children 6 months – 6 years (Ramsay, Martel, Porporino, & Zygmntowicz, 2011)

Circle the corresponding number on each item. Note that the meaning of the numbers varies – they do not all go in the same direction.

								FOR OFFICE USE ONLY
INFANT CODE:								V1
1. How do you find mealtimes with your child?	1	2	3	4	5	6	7	V68
	VERY DIFFICULT						EASY	
2. How worried are you about your child's eating?	1	2	3	4	5	6	7	V69
	NOT WORRIED						VERY WORRIED	
3. How much appetite (hunger) does your child have?	1	2	3	4	5	6	7	V70
	NEVER HUNGRY						GOOD APPETITE	
4. When does your child start refusing to eat during mealtimes?	1	2	3	4	5	6	7	V71
	AT THE BEGINNING						AT THE END	
5. How long do mealtimes take for your child (in minutes)?	1	2	3	4	5	6	7	V72
	1-10	11-20	21-30	31-40	41-50	51-60	>60MIN	
6. How does your child behave during mealtimes?	1	2	3	4	5	6	7	V73
	BEHAVES WELL						ACTS UP, MAKES A BIG FUSS	
7. Does your child gag or spit or vomit with certain types of food?	1	2	3	4	5	6	7	V74
	NEVER						MOST OF THE TIME	
8. Does your child hold food in his/her mouth without swallowing?	1	2	3	4	5	6	7	V75
	MOST OF THE TIME						NEVER	

9. Do you have to follow your child around or use distractions (toys, TV) so that your child will eat?	1	2	3	4	5	6	7	V76
	NEVER						MOST OF THE TIME	
10. Do you have to force your child to eat or drink?	1	2	3	4	5	6	7	V77
	MOST OF THE TIME						NEVER	
11. How are your child's chewing (or sucking) abilities?	1	2	3	4	5	6	7	V78
	GOOD						VERY POOR	
12. How do you find your child's growth?	1	2	3	4	5	6	7	V79
	GROWING POORLY						GROWING WELL	
13. How does your child's feeding influence your relationship with him/her?	1	2	3	4	5	6	7	V80
	VERY NEGATIVELY						NOT AT ALL	
14. How does your child's feeding influence your family relationships?	1	2	3	4	5	6	7	V81
	NOT AT ALL						VERY NEGATIVELY	
								FOR OFFICE USE ONLY
INFANT CODE:								V1
DATE OF SCREENING:								V2
BIRTHDATE:								V3
AGE:								V4

To get the total raw score:

1. **Enter the scores of the 7 items with Asterix in first column.**
2. **Reverse the scores for the items with Asterix in the 1st column (1→7, 2→6, 3→5, 4→4, 5→3, 6→2, 7→1) and enter the reversed scores in the 2nd column.**
3. **Enter the scores of the 7 items without Asterix in the 2nd column.**

Raw score	T-score	Raw score	T-score	T-score ranges	Interpretation
14	35	56	68	61 to 65	Mild difficulties
15	36	57	69		
16	37	58	70		
17	38	59	71	66 to 70	Moderate difficulties
18	39	60	72		
19	39	61	72		
20	40	62	73		
21	41	63	74	Above 70	Severe difficulties
22	42	64	75		
23	43	65	76		
24	43	66	76		
25	44	67	77		
26	45	68	78		
27	46	69	79		
28	46	70	80		
29	47	71	80		
30	48	72	81		

4. **Add the scores of the 14 items in the 2nd column to get total raw score.**										
ITEMS	1*			31	49	73	82			
	2			32	50	74	83			V68
	3*			33	50	75	83			V69
	4*			34	51	76	84			V70
	5			35	52	77	85			V71
	6			36	53	78	86			V72
	7			37	54	79	87			V73
	8*			38	54	80	87			V74
	9			39	55	81	88			V75
	10*			40	56	82	89			V76
	11			41	57	83	90			V77
	12*			42	57	84	91			V78
	13*			43	58	85	91			V79
	14			44	59	86	92			V80
TOTAL RAW SCORE:				45	60	87	93			V81
				46	61	88	94			V82
				47	61	89	94			
				48	62	90	95			
				49	63	91	96			
				50	64	92	97			
				51	65	93	98			
				52	65	94	98			
				53	66	95	99			
				54	67	96	100			
				55	68	97	101			
						98	102			
INTERPRETATION OF DIFFICULITES				1. MILD		2. MODERATE		3. SEVERE		V83
MCH-FS				PASS			FAIL			V84

SCHEDULE FOR ORAL-MOTOR ASSESSMENT (SOMA)

(Skuse, Stevenson, Reilly, & Mathisen, 1995)

					FOR OFFICE USE ONLY
INFANT CODE:					V1
DATE OF ASSESSMENT:					V2
DATE OF BIRTH:					V3
AGE:					V4
BODY POSITION:					V85
HEAD POSITION:					V86
SUPPORT REQUIRED:					V87
PURÉE					
1. YOGHURT			2. OTHER		V88
NON-RATABLE			**RATABLE**		
1. REFUSED	2. OMITTED	3. NOT OBSERVED	4. YES	5. NO	
REACT 1	Head orientation to spoon		4. YES	5. NO	V89 A B
SEQUENCE 1	Smooth rhythmic sequence		4. YES	5. NO	V90 A B
LIP 1	Lower lip draws inwards around spoon		4. YES	5. NO	V91 A B
LIP 2	Upper lip removes food from spoon		4. YES	5. NO	V92 A B
LIP 3	Lower/upper lip assists in cleaning		4. YES	5. NO	V93 A B
LIP 11	Lower lip active during suck/munch/chew		4. YES	5. NO	V94 A B
TONGUE 11	Consistent/ considerable protrusion		4. YES	5. NO	V95 A B
TONGUE 12	Protrusion beyond incisors		4. YES	5. NO	V96 A B
JAW 1	Graded jaw opening		4. YES	5. NO	V97 A B

SUM OF SHADED BOXES					V98
Cutting score: > 3 indicates oral motor dysfunction < 3 normal oral motor function			1. ORAL MOTOR DYSFUNCTION	2. ORAL MOTOR FUNCTION	V99
BODY POSITION:					V100
HEAD POSITION:					V101
SUPPORT REQUIRED:					V102
SEMI-SOLIDS					
1. PORRIDGE	2. MASHED BANANA		3. OTHER		V103
NON-RATABLE			**RATABLE**		
1. REFUSED	2. OMITTED	3. NOT OBSERVED	4. YES	5. NO	
DROOL 1	Consistent/considerable drooling		4. YES	5. NO	V104 A B
SEQUENCE 1	Smooth rhythmic sequence		4. YES	5. NO	V105 A B
INITIATION 1	Sequence initiated within 2 seconds		4. YES	5. NO	V106 A B
LIP 13	Lips closed during swallow		4. YES	5. NO	V107 A B
JAW 1	Graded jaw opening		4. YES	5. NO	V108 A B
JAW 2	Internal jaw stabilisation		4. YES	5. NO	V109 A B
JAW 3	External jaw stabilisation required 100%		4. YES	5. NO	V110 A B
JAW 10	Associated jaw movements		4. YES	5. NO	V111 A B
SUM OF SHADED BOXES					V112
Cutting score: > 4 indicates oral motor dysfunction < 4 normal oral motor function			1. ORAL MOTOR DYSFUNCTION	2. ORAL MOTOR FUNCTION	V113
BODY POSITION:					V114
HEAD POSITION:					V115
SUPPORT REQUIRED:					V116
SOLIDS					
1. BUTTERNUT AND SWEET POTATO	2. DRIED APRICOT		3. OTHER		V117
NON-RATABLE			**RATABLE**		
1. REFUSED	2. OMITTED	3. NOT OBSERVED	4. YES	5. NO	
FOOD LOSS 1	Non/trivial		4. YES	5. NO	V118 A B

DROOL 1	Consistent/considerable drooling	4. YES	5. NO	V119 A B
SEQUENCE 1	Smooth rhythmic sequence	4. YES	5. NO	V120 A B
LIP 1	Lower lip draws inwards around spoon	4. YES	5. NO	V121 A B
LIP 2	Upper lip removes food from spoon	4. YES	5. NO	V122 A B
LIP 4	Lower lip behind upper teeth/suckling	4. YES	5. NO	V123 A B
LIP 11	Lower lip active during suck/munch/chew	4. YES	5. NO	V124 A B
TONGUE 10	Transient/minimal tongue protrusion	4. YES	5. NO	V125 A B
JAW 1	Graded jaw opening	4. YES	5. NO	V126 A B
SUM OF SHADED BOXES				V127
Cutting score: > 4 indicates oral motor dysfunction < 4 normal oral motor function		1. ORAL MOTOR DYSFUNCTION	2. ORAL MOTOR FUNCTION	V128
BODY POSITION:				V129
HEAD POSITION:				V130
SUPPORT REQUIRED:				

CRACKER				
1. SOFT: MARIE BISCUIT	2. MEDIUM: LADY FINGERS	3. HARD: NUTTIKRUST	4. OTHER	V132

NON-RATABLE			RATABLE		
1. REFUSED	2. OMITTED	3. NOT OBSERVED	4. YES	5. NO	
FOOD LOSS 1	Profuse/marked food loss		4. YES	5. NO	V133 A B
DROOL 1	Profuse/marked drooling		4. YES	5. NO	V134 A B
INITIATION 1	Sequence initiated within 2 seconds		4. YES	5. NO	V135 A B
LIP 4	Lower lip behind upper teeth to suck		4. YES	5. NO	V136 A B
LIP 7	Lips close around stimulus during bite		4. YES	5. NO	V137 A B
LIP 9	Lips close intermittently during suck/munch/chew		4. YES	5. NO	V138 A B
TONGUE 10	Transient minimal tongue protrusion		4. YES	5. NO	V139

				A B
TONGUE 11	Considerable/consistent tongue protrusion	4. YES	5. NO	V140 A B
TONGUE 12	Protrusion beyond incisors	4. YES	5. NO	V141 A B
TONGUE 13	Protrusion beyond lips	4. YES	5. NO	V142 A B
JAW 2	Internal jaw stabilisation established	4. YES	5. NO	V143 A B
JAW 3	Variable stabilisation (not fully established)	4. YES	5. NO	V144 A B
JAW 4	External stabilisation required	4. YES	5. NO	V145 A B
JAW 5	Vertical movements	4. YES	5. NO	V146 A B
JAW 8	Wide vertical excursions	4. YES	5. NO	V147 A B
JAW 9	Small vertical excursions	4. YES	5. NO	V148 A B
JAW 11	Associated head movements to bite	4. YES	5. NO	V149 A B
JAW 12	Uses fingers to transfer food	4. YES	5. NO	V150 A B
SWALLOW 9	Gagging	4. YES	5. NO	V151 A B
BITE 5	Controlled sustained bite	4. YES	5. NO	V152 A B
BITE 8	Graded jaw opening	4. YES	5. NO	V153 A B
BITE 12	Mouths cracker only	4. YES	5. NO	V154 A B
SUM OF SHADED BOXES				V155
Cutting score: > 9 indicates oral motor dysfunction < 9 normal oral motor function		1. ORAL MOTOR DYSFUNCTION	2. ORAL MOTOR FUNCTION	V156
BODY POSITION:				V157
HEAD POSITION:				V158
SUPPORT REQUIRED:				V159
BOTTLE				
INDICATE LIQUID ADMINISTERED:				V160
NON-RATABLE		**RATABLE**		

1. REFUSED	2. OMITTED	3. NOT OBSERVED	4. YES	5. NO	
REACT 2	Anticipatory mouth opening		4. YES	5. NO	V161 A B
REACT 4	No liquid enters mouth		4. YES	5. NO	V162 A B
ACCEPT 2	Accepts liquid within 2 seconds		4. YES	5. NO	V163 A B
LIP 3	Upper lip firmly seals around teat		4. YES	5. NO	V164 A B
LIP 5	Intermittent/incomplete upper lip contact/seal		4. YES	5. NO	V165 A B
LIP 6	Intermittent/incomplete lower lip contact/seal		4. YES	5. NO	V166 A B
LIP 7	Lip closure during swallow		4. YES	5. NO	V167 A B
JAW 1	Small vertical movements		4. YES	5. NO	V168 A B
SEQUENCE 1	Smooth rhythmic sequence		4. YES	5. NO	V169 A B
SUM OF SHADED BOXES					V170
Cutting score: > 5 indicates oral motor dysfunction < 5 normal oral motor function			1. ORAL MOTOR DYSFUNCTION	2. ORAL MOTOR FUNCTION	V171
BODY POSITION:					V172
HEAD POSITION:					V173
SUPPORT REQUIRED:					V174
TRAINER CUP					
INDICATE LIQUID ADMINISTERED:					V175
NON-RATABLE			**RATABLE**		
1. REFUSED	2. OMITTED	3. NOT OBSERVED	4. YES	5. NO	
LIQUID LOSS	Profuse/marked liquid loss		4. YES	5. NO	V176 A B
SEQUENCE 2	Panic reactions when liquid presented		4. YES	5. NO	V177 A B
SEQUENCE 3	Choking		4. YES	5. NO	V178 A B
TONGUE 10	Tongue thrust		4. YES	5. NO	V179 A B
TONGUE 11	Asymmetry		4. YES	5. NO	V180 A B

JAW 1	Small vertical movements	4. YES	5. NO	V181 A B
JAW 6	Jaw alignment during drinking	4. YES	5. NO	V182 A B
JAW 10	External jaw stabilisation required 100%	4. YES	5. NO	V183 A B
JAW 12	Internal stabilisation	4. YES	5. NO	V184 A B
SWALLOW 1	Jaw alignment	4. YES	5. NO	V185 A B
SWALLOW 4	Panic reactions during/after swallow	4. YES	5. NO	V186 A B
SWALLOW 5	No swallow observed	4. YES	5. NO	V187 A B
SWALLOW 6	Uses gravity, e.g. head extension	4. YES	5. NO	V188 A B
SWALLOW 7	Numerous attempts to initiate swallow	4. YES	5. NO	V189 A B
	SUM OF SHADED BOXES			V190
Cutting score: > 5 indicates oral motor dysfunction < 5 normal oral motor function		1. ORAL MOTOR DYSFUNCTION	2. ORAL MOTOR FUNCTION	V191
BODY POSITION:				V192
HEAD POSITION:				V193
SUPPORT REQUIRED:				V194
	CUP			
INDICATE LIQUID ADMINISTERED:				V195
NON-RATABLE			**RATABLE**	
1. REFUSED	2. OMITTED	3. NOT OBSERVED	4. YES	5. NO
ACCEPT 2	Accepts within 2 seconds		4. YES	5. NO V196 A B
SEQUENCING 2	Panic reactions when liquid placed in mouth		4. YES	5. NO V197 A B
SEQUENCING 3	Choking		4. YES	5. NO V198 A B
LIQUID LOSS	Profuse/marked liquid loss		4. YES	5. NO V199 A B
TONGUE 10	Tongue thrust		4. YES	5. NO V200 A B
TONGUE 11	Asymmetry		4. YES	5. NO V201 A B

JAW 1	Small vertical movements	4. YES	5. NO	V202 A B
JAW 4	Jaw clenching	4. YES	5. NO	V203 A B
SWALLOW 9	Gagging	4. YES	5. NO	V204 A B
SUM OF SHADED BOXES				V205
Cutting score: > 5 indicates oral motor dysfunction < 5 normal oral motor function		1. ORAL MOTOR DYSFUNCTION	2. ORAL MOTOR FUNCTION	V206

PURÉE	SEMI-SOLIDS	SOLIDS	CRACKER	BOTTLE	TRAINER CUP	CUP	1. PASS	2. FAIL	V207 A B C D E F G

Appendix F: Parent's Evaluation of Developmental Status

Parent's Evaluation of Developmental Status (PEDS)

(Glascoe, 1997)

PEDS RESPONSE FORM	
1. Please list any concerns about your child's learning, development, and behaviour.	○ No ○ A little ○ Yes ○ COMMENTS
2. Do you have any concerns about how your child talks and makes speech sounds?	○ No ○ A little ○ Yes ○ COMMENTS
3. Do you have any concerns about how your child understands what you say?	○ No ○ A little ○ Yes ○ COMMENTS
4. Do you have any concerns about how your child uses his or hands and fingers to do things?	○ No ○ A little ○ Yes ○ COMMENTS
5. Do you have any concerns about how your child uses his or her arms and legs?	○ No ○ A little ○ Yes ○ COMMENTS
6. Do you have any concerns about how your child behaves?	○ No ○ A little ○ Yes ○ COMMENTS
7. Do you have any concerns about how your child gets along with others?	○ No ○ A little ○ Yes ○ COMMENTS
8. Do you have any concerns about how your child is learning to do things for himself/herself?	○ No ○ A little ○ Yes ○ COMMENTS

9. Do you have any concerns about how your child is learning preschool or school skills?	○ No ○ A little ○ Yes ○ COMMENTS
10. Please list any other concerns.	○ No ○ A little ○ Yes ○ COMMENTS

PEDS SCORE FORM		
Childs age:	6-11 months	12-14 months
Global/Cognitive	◯	◯
Expressive Language and Articulation	◯	◯
Receptive Language	☐	☐
Fine-Motor	☐	☐
Gross Motor	☐	☐
Behaviour	☐	☐
Social-emotional	◯	◯
Self-help	☐	☐
School	☐	☐
Other	◯	◯
Count the number of small circles with checkmarks and place the total in the large circle below.		
	◯	◯
If the number shown in the large circle is 2 or more, follow Path A on the PEDS Interpretation Form. If the number shown is exactly 1, follow Path B. If the number is 0, count the number of small boxes and place the total in the large box below.		

	☐	☐
If the number shown in the large box is 1 or more, follow Path C. If the number 0 is shown, consider Path D if relevant. Otherwise follow Path E.		

INTERPRETATION OF RESULTS		
PATH A:	Two or more significant concerns.	FAIL irrespective of the outcome of the PEDS-DM.
PATH B:	One significant concern.	Conduct the PEDS-DM. If the infant passes the PEDS-DM, they pass the PEDS tools. If the infant fails the PEDS-DM, a referral for further assessment is required.
PATH C:	Nonsignificant concerns.	Conduct the PEDS-DM. If the infant passes the PEDS-DM, they pass the PEDS tools. If the infant fails the PEDS-DM, a referral for further assessment is required.
PATH D:	Parental difficulties communicating.	Conduct the PEDS-DM. If the infant passes the PEDS-DM, they pass the PEDS tools. If the infant fails the PEDS-DM, a referral for further assessment is required.
PATH E	No concerns.	PASS irrespective of the outcome of the PEDS-DM.

Parent's Evaluation of Developmental Status – Developmental Milestones (PEDS – DM)

(Brothers, Glascoe, & Robertshaw, 2008)

Only forms applicable to current study are included.

FORM B (3 – 4 MONTHS)	
Are your baby's hands open most of the time, not in a fist?	• No • A little ○ Yes
Does your baby seem excited when seeing a bottle or breast?	• No • Sometimes ○ Yes
Does your baby make special sounds when he or she is happy?	• No ○ Sometimes ○ Yes
Does your baby roll from her back to her side?	• No ○ Sometimes ○ Yes
Does your baby open his mouth when he sees a bottle, breast, or pacifier?	• No • Sometimes • Yes
Does your baby smile or make speech sounds as a way to get your attention?	• No ○ Sometimes ○ Most of the time
FORM C (5 – 7 MONTHS)	
When your baby is holding a toy in each hand, does he or she look from one hand to the other?	• No • A little ○ Yes
When you say things like, "Come here", does your baby hold out his or her arms?	• No ○ Sometimes ○ Yes
Does your baby "talk" or make sounds when he or she holds a toy or sees a pet?	• No ○ Sometimes ○ Yes

If your baby is lying on her back can she pass a toy from one hand to the other?	• No ○ Sometimes ○ Yes
If you try to give more food than your baby wants, does he keep his lips closed or turn away?	• No • A little ○ Yes
When you play gentle tickling games with your baby, does he or she enjoy this?	• No/haven't tried ○ Sometimes ○ Most of the time
FORM D (8 – 10 MONTHS)	
Can your baby poke at things with just his or her first finger?	• No • A little ○ Yes
When you say your baby's name, does he or she stop and look at you?	• No • Sometimes ○ Most of the time
How many different sounds such as "muh", "bah", "duh" or "guh" does your baby say?	• None • 1 ○ 2 or more
Can your baby get around on hands and knees or by scooting on his or her bottom?	• No ○ Sometimes ○ Yes
Does your baby try to get to toys that are out of reach?	• No • A little ○ Yes
Does your baby like to play peek-a-boo?	• No/Never tried • A little ○ Yes
FORM E (11 – 13 MONTHS)	
Can your baby make squeeze toy squeak – or try to?	• No ○ A little ○ Yes
When you say things like, "Where's your bottle?" does your baby look around for his bottle?	• No • Sometimes ○ Most of the time
Does your baby put lots of sounds together that sound like talking?	• No ○ Sometimes ○ Yes
If you hold only one of your baby's hands, can he or she take a few steps?	• No • A little ○ Yes
Can your baby drink (not suck) from a cup?	• No/Don't know • A little ○ Yes
Does your baby look for new things to play with and try to figure out how they work – like busy boxes or squeaking toys?	• No

	• A little ○ Often

Grey circles are a fail, white is a pass. If a child fails any one of the questions the child fails the whole PEDS – DM test.

HOW FORM B – E IS STRUCTURED:

1. Fine motor = Refer to occupational therapist
2. Receptive language = Refer to speech-language pathologist
3. Expressive language = Refer to speech-language pathologist
4. Gross motor = Refer to occupational therapist
5. Adaptive behaviour (self-help) = Refer to occupational therapist
6. Social-emotional = Refer to speech-language pathologist

Appendix H: Proof of submission to Infants & Young Children

IYC Submission Confirmation for Feeding and Developmental Outcomes of Infants in an Underserved Community

IC em.iyc.0.5cd42c.f2cd456f@editorialmanager.com <em.iyc.0.5cd42c.f2cd456f@editorialmanager.

2018/07/27 9:18 AM

To: Bronwyn Eales

07/27/2018

Dear Miss Eales,

Your submission entitled "Feeding and Developmental Outcomes of Infants in an Underserved Community" has been received by the journal editorial office.

You will be able to check on the progress of your paper by logging on to Editorial Manager as an author.

https://iyc.editorialmanager.com/

Your username is:

Your manuscript will be given a reference number once an Editor has been assigned.

Thank you for submitting your work to this journal.

Kind Regards,

Infants and Young Children

A manuscript number has been assigned to your IYC submission

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2018/10/01 4:35 AM

To: Bronwyn Eales

09/30/2018

Dear Miss Eales,

Your submission entitled "Feeding and Developmental Outcomes of Infants in an Underserved Community" has been assigned the following manuscript number: IYC-D-18-00052.

You will be able to check on the progress of your paper by logging on to Editorial Manager as an author.

https://iyc.editorialmanager.com/

Your username is:

Thank you for submitting your work to Infants and Young Children.

Kind Regards,

Linda Procko, Editorial Assistant
Managing Editor
Infants and Young Children