

**COMMUNICATION DEVELOPMENT OF HIGH-RISK  
NEONATES FROM ADMISSION TO DISCHARGE FROM  
A KANGAROO MOTHER CARE UNIT**

BY

**ALETHEA McINROY**

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SUPERVISOR: PROF A. KRITZINGER  
CO-SUPERVISOR: MRS U. ZSILAVECZ

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*The person who gives meaning to life and everything I do in this life, my Lord Jesus Christ. Thank you for Your endless grace and provision and that You always know the end from the beginning.*

*Jeremiah 29:11*

*For I know the thoughts that I think toward you, says the Lord, thoughts of peace and not of evil, to give you a hope and a future.*

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## Summary

Advances in neonatology have led to increased numbers of high-risk neonates surviving and intensified interest in the developmental outcomes of this population. In the South African context prematurity and low birth weight are the most common causes of death in the perinatal period and the same risk factors that contribute to infant mortality also contribute to the surviving infants' increased risk for developmental delays. As a result of the interacting biological and environmental risk factors of prematurity, low birth weight, poverty and HIV and AIDS in the South African context Kangaroo Mother Care (KMC) has been developed as best practice to promote infant survival and to facilitate mother-infant attachment. Mother-infant attachment may lead to synchronous interaction patterns between the mother and infant which forms the basis of early communication development.

Early communication intervention (ECI) services are recommended as early as possible as high-risk infants are especially at risk for feeding difficulties and communication developmental delays. It is, however, not clear what the content of an ECI programme should be and how it should be implemented according to the changing communication and feeding developmental needs of the infant while receiving KMC. There appears to be a dearth of research on the earliest stages of communication development in high-risk neonates, which should form the foundation of such a programme. A descriptive survey was conducted to describe the development of 25 high-risk infants and their mothers' changing needs from admission to discharge from a KMC unit. Each participant and mother dyad was followed up over an average of 11 days of data collection with three to four data collection sessions. Data was collected by means of direct observation during routine care-giving activities. The different developmental subsystems of the participants' feeding, communication, neuro-behavioural organization and mother-neonate interaction were described.

The results demonstrated that subtle, but definite changes could be observed in the participants' development. Development in all the different areas occurred over time as

the participants progressed through the three developmental states of the in-turned state, coming-out state and reciprocity state. As the participants progressed during the 11 days of data collection and were increasingly able to attend to their environment, they also developed the ability to regulate and organize their own behaviour in order to develop more complex communication, feeding and interaction skills with their mothers. The functioning of the participants' sensory systems developed in a specific order namely tactile, auditory and then visual. Although the participants developed consistently throughout their stay in the KMC unit, mother-neonate interaction never reached optimal levels. The importance of an individualized training programme for each mother is reflected in the finding that the neonate's developmental level and progress needs to be considered when implementing the ECI programme.

The need for speech-language therapy involvement in KMC is emphasized in the light of a shortage of practicing speech-language therapists in South Africa. It is therefore imperative that the prevention of communication delays and feeding difficulties in high-risk neonates as well as parent training assume priority.

Key words

Kangaroo Mother Care (KMC); mother-infant attachment; mother-infant interaction; early communication intervention (ECI); precursors of communication development; risk factors; developmentally appropriate care; prematurity; low birth weight.

## Opsomming

Vooruitgang in neonatologie het gelei tot 'n toenemende aantal hoërisikoneonate wat oorleef en al hoe meer aandag word geskenk aan die ontwikkelingsuitkomste van die populasie. In die Suid-Afrikaanse konteks is prematuriteit en lae-geboortegewig die vernaamste oorsake van sterftes in die perinatale periode en dieselfde faktore wat bydra tot neonaat mortaliteit dra ook by tot die oorlewendes se risiko vir ontwikkelingsagterstande. As gevolg van die wisselwerking tussen die biologiese en omgewingsrisikofaktore van prematuriteit, lae-geboortegewig, armoede en MIV en VIGS in die Suid-Afrikaanse konteks is Kangeroe Moedersorg (KMS) ontwikkel as beste praktyk vir die oorlewing van neonate en om moeder-baba hegting te fasiliteer. Moeder-baba hegting kan lei tot gesinkroniseerde interaksiepatrone tussen moeder en baba wat die basis vorm vir vroeë kommunikasie-ontwikkeling.

Vroeë kommunikasie intervensie (VKI) word so vroeg as moontlik aanbeveel aangesien hoërisikobabas veral 'n risiko vir voedingsprobleme en kommunikasie-ontwikkelingsagterstande toon. Dit is egter nie duidelik wat die inhoud van 'n VKI program moet wees nie en ook nie hoe dit geïmplimenter moet word volgens die veranderende kommunikasie- en voedingsbehoefte van die neonate terwyl hulle KMS ontvang nie. Dit blyk dat daar 'n tekort bestaan aan navorsing oor die vroegste stadiums van kommunikasieontwikkeling by hoërisikoneonate wat die grondslag van 'n VKI program behoort te vorm. 'n Beskrywende opname is uitgevoer om die ontwikkeling van 25 neonate en hulle moeders se veranderende behoeftes te beskryf vanaf opname tot ontslag uit 'n KMS eenheid. Elke deelnemer-moeder diade is opgevolg oor 'n gemiddeld van 11 dae vir 3 tot 4 data-insameling sessies. Data is ingesamel deur direkte observasie van roetine versorgingsaktiwiteite. Die verskillende subsisteme van ontwikkeling van die deelnemers se voeding, kommunikasie, bewuslike toestand en vermoë tot organisasie en moeder-baba interaksie is beskryf.

Die resultate het getoon dat daar subtiele, tog, definitiewe veranderinge in die deelnemers se ontwikkeling waargeneem is. Ontwikkeling het in alle areas plaasgevind soos die deelnemers deur die ingekeerde, ontluiking en gereed-vir-interaksie stadiums beweeg het. Soos wat die deelnemers gevorder het tydens die 11 dae van data-insameling was hulle toenemend in staat om aandag te gee aan hulle omgewing en om hulle gedrag te reguleer en organiseer wat gevolglik gelei het tot meer komplekse voedings- en kommunikasiegedrag en interaksie met hulle moeders. Die funksionering van die deelnemers se sensoriese sisteme het in 'n spesifieke volgorde ontwikkel naamlik taktiel, ouditief en laastens visueel. Alhoewel die deelnemers teen 'n konstante tempo ontwikkel het tydens hulle verblyf in die KMS eenheid, het moeder-baba interaksie nie optimale vlakke bereik nie. Die belang van 'n geïndividualiseerde opleidingsprogram vir elke neonaat se moeder word gereflekteer in die bevinding dat elke neonaat se individuele vlak van ontwikkeling in aggeneem moet word wanneer die VKI program geïmplimenteer word.

Die behoefte aan spraak-taal terapie betrokkenheid in die konteks van KMS word beklemtoon in die lig van 'n tekort aan spraak-taal terapeute in Suid-Afrika. Gevolglik is dit uiters belangrik dat die voorkoming van kommunikasie-agterstande en voedingsprobleme by hoë-risikoneonate sowel as en ouer opleiding prioriteit geniet.

#### Sleutelwoorde

Kangeroe Moedersorg (KMS); moeder-baba hegting, moeder-baba interaksie; vroeë kommunikasie intervensie (VKI); voorlopers van kommunikasieontwikkeling; risiko faktore; ontwikkelingstoepaslike sorg; prematuriteit; lae-geboortegewig

# CHAPTER 1

## PERSPECTIVES ON KANGAROO MOTHER CARE RESEARCH AND STATEMENT OF THE PROBLEM

***Aim:** To provide a rationale for the study by describing the different aspects and benefits of Kangaroo Mother Care (KMC) for the high-risk infant and the need for speech-language therapy services in the context of a KMC programme. A solution is proposed to the question of the speech-language therapist's involvement in KMC. Important and relevant concepts used in the study are defined and the organization and description of the different chapters are also included.*

### 1.1 INTRODUCTION

Advances in neonatology have led to an increased number of high-risk neonates surviving, and intensified interest in the developmental outcomes of this population (Hack, 2001; Rossetti, 2001). In the South African context prematurity and low birth weight are the most common causes of death in the perinatal period (Kritzinger & Louw, 1999; Pattinson, 2002), and the risk factors that contribute to infant mortality also contribute to surviving infants' increased risk for developmental delays (Rossetti, 2001). These developmental delays due to various biological risk factors are often exacerbated by coexisting environmental risk factors such as poverty (Bennett, 1995; Poulsen, 1995). Risk factors also include inadequacies in the quality of familial, medical, therapeutic and educational care provided to the infant and family immediately following birth (Widerstrom & Nickel, 1997). The risk for developmental delays significantly increases when these infants, who are already at biological and/or environmental risk, do not receive early intervention services (Rossetti, 2001). As a result of the interacting biological and environmental risk factors of prematurity, low birth weight, poverty and HIV and AIDS in the South African context (Kritzinger, 2004) KMC has been developed as an alternative method to promote infant survival and to facilitate mother-infant attachment (Van Rooyen, Pullen, Pattinson & Delpont, 2002). KMC is now established as



best practice for the caring of newborn infants, but especially of high-risk neonates (Power, 2002). Early communication intervention (ECI) services are recommended as early as possible as high-risk infants are especially at risk of feeding difficulties and communication developmental delays (Arvedson & Brodsky, 2002; Brown & Ruder, 1995; Rossetti, 2001). ASHA (2004) is clear about the speech-language therapist's role in the Neonatal Intensive Care Unit (NICU) regarding communication and feeding intervention as well as education of caregivers and staff, and the expertise of the speech-language therapist to contribute collaboratively in a NICU. The question now arises about the role of the speech-language therapist in a KMC programme where parents are the primary caregivers of their infants.

As a result of the complexity of the field of neonatology and developmentally appropriate care, and its rapid advances, the speech-language therapist involved in a KMC programme requires specialized knowledge and skills to facilitate best practice during ECI with these high-risk neonates and their mothers. In the South African context where there is a shortage of practicing speech-language therapists, it is imperative that prevention of communication delays, feeding difficulties and ECI assume priority (Arvedson & Brodsky, 2002; Moodley, Louw & Hugo, 2000; Tuomi, 1994). During the neonatal period, ECI needs to be facilitated by implementing an appropriate service-delivery model that is based on community needs and resources (Fair & Louw, 1999). An effective and appropriate service delivery model is especially important since eight KMC units were already operating in the country in 2003. Currently, South African guidelines for neonatal care are being developed and it appears that the practice of KMC will be included as an essential intervention (Guidelines for Neonatal Care, 2004; Health for a Better Life, 2002/2003). If KMC is to become such an important intervention technique in the national health-care system, the speech-language therapist has the responsibility to facilitate best practice in the context of a KMC programme by providing appropriate ECI services with the aim of minimizing these neonates' risk of feeding difficulties and communication delays.

## 1.2 PERSPECTIVES ON KANGAROO MOTHER CARE RESEARCH

KMC is a natural way of caring for low birth weight and/or premature infants and has become “a method of choice in selected hospitals throughout the United States and Europe” (Feldman, 2004: 145). In its country of origin, Colombia, a series of clinical trials proved that KMC in comparison to standard incubator care did not increase infant mortality or morbidity (Feldman, 2004). On the contrary, research has established KMC as a natural and cost-free intervention which significantly benefits the infant and the mother-infant dyad without the prerequisite of sophisticated methodology and extensive training (Feldman, 2004; Hann, Malan, Kronson, Bergman & Huskisson, 1999; Van Rooyen et al., 2002). The only requirements for the successful implementation of a KMC programme may be the dedication and enthusiasm from health-care personnel and motivation from the mother to implement KMC (Bergman & Jürisoo, 1994; Harrison, 2002).

According to Bergman (2004), developing mammals have the physical capability and are neuro-behaviourally programmed to act in a certain way in a specific habitat (e.g. the uterus, the mother’s body, the world) to provide for its own needs. The developing organism is equipped with behaviours which, when expressed in the correct habitat, result in the organism’s needs being met (Bergman, 2004). Skin-to-skin contact during the immediate newborn period represents the correct habitat for the newborn, and the pre-programmed behaviour for this habitat is represented by breast feeding. Bergman (2004:1) regards this “biological or neurobehavioural hypothesis as the underlying mechanism for why KMC works so well”. When removed from the correct habitat all mammals display a protest-despair response. The protest response refers to the organism seeking reunion with the correct habitat, and the despair response can be described as a survival response resulting in a decrease in temperature and heart rate and a rise in stress hormones (Bergman, 2004). Reunion with the correct habitat results in a rise in heart rate and temperature (Bergman, 2004; Feldman, 2004). Furthermore, the basic biological needs of oxygenation, warmth, nutrition and protection, which were provided by the mother’s uterus, also need to be provided by the habitat after birth (Bergman, 2004).

Research supports that the skin-to-skin habitat which the mother provides, results in these basic needs of the infant being met (Bergman, 2004; Simkiss, 1999; Van Rooyen et al., 2002). Therefore the mother's physical presence which comprises her touch, voice, smell, nursing, biological rhythms, body heat and unique interactive style can be described as the central regulatory framework that promotes the infant's development (Feldman, 2004).

Although premature infants are equipped with the same neurobehavioural programme and behaviours as full-term infants, they have a need for support in the correct habitat due to their physical immaturity (Bergman, 2004). KMC provides an ideal environment that includes skin-to-skin contact, exclusive breast feeding and early discharge from hospital care within a context that supports both the infant and its parents (Bergman, 2004; Simkiss, 1999; Van Rooyen et al., 2002). The health-care worker, regardless of occupation, therefore has the responsibility to support KMC and contribute to the short and long-term effectiveness and outcomes of KMC by facilitating optimal development of the infant within the dyadic relationship of mother and infant. Apart from supporting KMC, the question arises of how the knowledge and skills of a speech-language therapist specializing in ECI may be utilized in a KMC programme? In order to answer the question of the speech-language therapist's contribution, an in-depth review of KMC research is required.

Research has indicated numerous benefits of KMC for the infant, the family and the health-care system. Some of these benefits include improved physiological stability of the infant, an increased sense of mother-infant attachment and significant cost-cutting to the health-care system (Bergman, 2004; Bergman, Malan & Hann, 2003; Simkiss, 1999; Van Rooyen et al., 2002). The infant demonstrates improved physiological stability as indicated by a lower and more stable heart rate, a decrease in apnoea and bradycardia, the maintenance of a constant body temperature and improved oxygenation (Feldman, 2004; Föhe, Kropf & Avenarius, 2000). The benefits of KMC are especially significant due to the fact that the premature and/or low birth weight infant's physiological and neurological developmental systems are immature and unprepared for the demands of the

extra-uterine environment during a period when the brain grows faster than during any other developmental phase (Als, 1999).

The extra-uterine environment is often characterized by excessive levels of sensory stimuli such as high levels of noise, light, excessive movement and pain, which all contribute to an inappropriate pattern of stimulation (Feldman, 2004; Widerstrom & Nickel, 1997; Young, 1997). These demands of the extra-uterine environment on the infant's developing central nervous system can have a negative impact on the infant's neurophysiological, psycho-emotional and psychosocial development (Als, 1999), hence the aim of developmentally appropriate care to reduce detrimental stimuli and to provide appropriate opportunities for development (Young, 1997). KMC has shown to promote more regulated sleep-wake cycles in infants, which form the foundation for regulation in other developmental systems (Feldman, 2004). This includes stability and maturation in the autonomic, motor, state, attention-interaction and self-regulation neurobehavioural systems in the infant (Als, 1999; Feldman, 2004).

The autonomic subsystem refers to the infant's physiological response to the environment, such as heart rate, respiration, blood pressure, temperature control, fluid balance and hormonal production. Organization in other subsystems is dependent on autonomic stability, therefore this is the first subsystem the infant needs to gain control (Ludington-Hoe & Swinth, 1996; Willemse, 2000). KMC facilitates improvement in physiological functions and accordingly provides an environment that supports autonomic stability (Feldman & Eidelman, 2003; Ludington-Hoe & Swinth, 1996).

KMC also contributes to motor regulation by means of the upright and contained posture of the infant in KMC. This prone position improves lung mechanics which consequently improves oxygenation and reduces agitation and jerky movements in the infant (Ludington-Hoe & Swinth, 1996).

The next subsystem is the state subsystem which includes the infant's ability to display and transit between different states from sleep to the aroused state (Ludington-Hoe &

Swinth, 1996; Willemse, 2000). Interventions during the perinatal period should aim at reducing active sleep and crying and fostering quiet sleep which protects the infant from environmental stimuli and encourages motor control (Ludington-Hoe & Swinth, 1996). KMC does just that by reducing the time spent in active sleep and crying and increasing the amount of time the infant spends in quiet sleep (Feldman, 2004; Ludington-Hoe & Swinth, 1996).

The attention-interaction subsystem functions within the state system (quiet alert), enabling the infant to focus on and process input from the environment. Although the attention-interaction subsystem is rarely visible before 40 weeks post-conceptual age, some infants receiving KMC have been observed gazing at their mothers and trying to get into an en-face position with their mothers (Ludington-Hoe & Swinth, 1996).

Maintaining a balance of all the neurobehavioural subsystems by implementing self-consoling behaviours is known as self-regulation (Ludington-Hoe & Swinth, 1996; Willemse, 2000). During KMC, self-consoling behaviour is often not required as the infants are relaxed and usually fall asleep. A self-regulating behaviour that is, however, always available during KMC is suckling or breast feeding (Ludington-Hoe & Swinth, 1996).

Consequently, KMC has a positive effect on the rate of autonomic maturation and state organization, contributing to a more optimal neurobehavioural status in the infant. The mother-infant contact seems to facilitate a balance between under and overstimulation of the infant resulting in a controlled and modulated pattern of stimulation contributing to neurobehavioural development (Feldman & Eidelman, 2003). The role of the speech-language therapist is emphasised as KMC primes the neonate's five subsystems for more successful feeding behaviour and communication interaction. KMC therefore "is an intervention that meets developmental care criteria by fostering neurobehavioural development" (Ludington-Hoe & Swinth, 1996:691). This is especially significant as neurobehavioural, cognitive and motor development have been related to the degree of state organization at term age (Feldman & Eidelman, 2003). The KMC approach thus

forms a central part of developmentally appropriate intervention which facilitates stability and maturation of the various subsystems of functioning and consequently contributes to an environment that supports physiological and behavioural organization in the high-risk neonate. This, in turn, facilitates the neonate's conservation of energy for growth, clearer behavioural cues, parent-infant attachment and the development of self-consoling behaviours (Feldman, 2004; Koch, 1999). It appears that KMC not only primes the high-risk neonate for improved feeding behaviour and communication interaction skills, but also primes the care-giving environment for facilitating the infant's communication development.

Research has also indicated that mothers practicing KMC look at and touch their infants more frequently and are more adaptive to their infants' signals (Feldman Eidelman, Sirota & Weller, 2002). This development within the mother-infant relationship aids the disrupted interaction patterns between mother and infant. High-risk infants are often disorganized, behaviourally less active, initiate fewer interactions and provide limited feedback to their parents, which lead to interaction patterns that may be less synchronous and reciprocal than the interaction between a healthy term-infant and mother (Als, 1999; Feldman, 2004; Gottwald & Thurman, 1995; Wyly, 1995). The nature of early interaction patterns between mother and infant is especially important to the speech-language therapist as it defines the interaction patterns throughout the first year or two of the infant's life which, in turn, contribute to the infant's communication development (Gottwald & Thurman, 1995; Rossetti, 2001). The mother-infant relationship is also crucial as the mother should operate as a barrier between the infant and the overstimulating extra-uterine environment and should provide appropriate care-giving according to the infant's needs (Poulsen, 1995). In the context of KMC infants are better equipped to cope with the complex extra-uterine environment and are able to establish more effective patterns of interaction with their parents, facilitating more sensitive care-giving (Feldman, 2004; Koch, 1999). Therefore, the early intervention team now not only works to ensure survival of high-risk neonates, but also to foster best development (Als, 1999).

Although KMC provides an ideal environment for the parent-infant relationship to develop, it is important to remember that pre-term birth may have a devastating effect on the mother and has psychosocial implications both for her and the infant (Sekudu, 1996). Parents of premature infants are often overwhelmed with feelings of helplessness, anxiety, fear, worry, guilt, aggression, denial and depression (Güldenpfennig, 2000; Moehn & Rossetti, 1996). These feelings could lead to uncertainty regarding the parents' perception of their role in the health-care system and consequently lead to difficulties regarding their involvement with the care of the infant (Güldenpfennig, 2000). Furthermore, the normal attachment process between mother and infant, which already starts during pregnancy and needs to be continued after birth, is interrupted by the neonate's premature birth and need for medical care (Klaus & Kenell, 2001; Moehn & Rossetti, 1996). Holding of the infant as well as the seeing, smelling, caring for and breast feeding of the infant, which all contribute to mother-infant attachment, may also be delayed (Klaus & Kenell, 2001). In a KMC programme these areas may be enhanced when KMC is practised, even when it is practised intermittently, at an early stage in the perinatal period .

Consequently, KMC is regarded as best practice for high-risk neonates as it has been proven to reduce separation from the mother, maternal depression and stress, increase positive feelings towards the infant and facilitate a better sense of the parenting role (Feldman, 2004). The infant's increased state of alertness also encourages socio-communicative development (Rossetti, 2001) which, in turn, facilitates mother-infant attachment that forms the basis of communication development (Billeaud, 2003). Early intervention services and specifically direct ECI services starting at birth is emphasized. In order to ensure best practice it is important that these infants and their families already receive appropriate early intervention services and specifically ECI services during the period when KMC is practised. It is therefore imperative that speech-language therapists improve their knowledge and understanding of the factors that influence the mother-infant relationship and consequently the early interaction patterns between mother and infant in a KMC programme.

KMC has also proved to benefit the mothers by increasing their nursing rate and maternal lactation (Feldman, 2004; Hurst, Valentine, Renfro, Burns & Ferlic, 1997). Improved lactation is of significant value as breast milk is not only of paramount nutritional advantage to premature infants, but also encourages breast feeding due to a decreased need for expressing breast milk (Feldman, 2004; Hurst et al., 1997). Mothers who have applied KMC also tend to practice exclusive breast feeding and continue to breast feed after discharge from the health-care system (Anderson, Chiu, Morrison, Burkhammer & Ludington-Hoe, 2004; Hann et al., 1999; Hurst et al., 1997). In developing countries formula feeding could be unaffordable and dangerous, making breast feeding a metabolic, immunological and nutritional benefit to the infant, as well as an economic advantage to the health-care system (Hann et al., 1999). As KMC promotes breast feeding and enhances the mother's confidence and competence in handling and caring for her infant, earlier and safer discharge at a lower weight is made possible, which makes KMC a cost-effective intervention method (Cattaneo, Davanzo, Bergman & Charpak, 1998; Hann et al., 1999).

Not only does KMC provide an ideal context which directly impacts on the infant by contributing to feeding and growth, health and neurophysiological organization, and indirectly by improving parental perceptions and interactive behaviour, it also contributes to the long-term developmental outcomes of these high-risk infants (Bergman et al., 2003; Feldman, 2004; Feldman et al., 2002). KMC has proved to have a positive affect on the motor and cognitive development of high-risk infants which include gains in mental capacity, information processing, reasoning skills, categorization and early representational thought at the ages of 6 to 24 months (Feldman, 2004; Feldman et al., 2002). After discharge from the hospital parents who applied KMC often provided a more appropriately stimulating and sensitive home environment for their infants. Social interactions are characterized by sensitive and adaptive behaviour from the mothers which facilitates longer periods of sustained visual attention and exploration; this, in turn, contributes to mutual play between mother and infant (Feldman, 2004; Feldman et al., 2002). It is clear that the improvement of the infant's early regulatory skills elicits more sensitive parenting and creates increased opportunities for matched interaction. Therefore



the dyadic reciprocity between mother and infant is high, contrary to an expected decrease in maternal sensitivity, an increased intrusiveness, lower reciprocity and lower infant involvement (Feldman, 2004; Feldman et al., 2002) when KMC is not practiced. As maternal and infant behaviours influence each other it is evident that KMC contributes to this mutual influencing, resulting in improved developmental outcomes (Feldman, 2004; Feldman et al., 2002). These positive effects of KMC are significant as premature infants have shown to display poor motor and behavioural development within the context of developmental coordination disorders as well as learning disabilities at an older age (Foulder-Hughes & Cooke, 2003; Robinson & Gonzalez, 1999). Although it seems that mother-infant interaction improves as a result of KMC, even after discharge from a hospital, it is not clear what the effects are of KMC on these infants' communication development after discharge from hospital (Bergman et al., 2003; Feldman, 2004; Feldman et al., 2002).

Although KMC is primarily a nursing intervention (Van Rooyen et al., 2002), a collaborative transdisciplinary approach is advocated in order to provide comprehensive and improved services to neonates at risk of communication developmental delays and their families by designing and implementing individualized developmentally appropriate care programmes (Kritzinger & Louw, 1999; McInroy & Kritzinger, 2005; Moodley, 1999). These individualized developmental care programmes should be based on the infant's level of functioning within the extra-uterine environment (Blanchard, 1995). As the developmental rate of pre-term infants is less predictable than full-term infants, it is important to identify the high-risk infant's and the family's changing needs in the hospital (Connors Lenke, 2003). To identify these needs, data is needed regarding the early and ongoing development of infants in KMC and the influence of the different developmental subsystems on their communication development and feeding behaviour. Although KMC promotes the infant's developmental progress within and outside of the hospital (Feldman, 2004; Van Rooyen et al., 2002), the exact steps of the developmental progress are unknown. Although KMC also has a positive effect on mother-infant interaction after discharge from the health-care system (Feldman, 2004; Rutherford, 1998), it is not clear

how the high-risk infant's communication skills develop while receiving KMC in the hospital.

### **1.3 PROBLEM STATEMENT AND RATIONALE**

It is evident that speech-language therapists have a role to play in the context of KMC as they may contribute to the domains of feeding, mother-infant interaction and communication intervention (Arvedson & Brodsky, 2002; ASHA, 2004). As communication development, feeding and oral-motor behaviour are part of the early communication intervention services provided to infants (Billeaud, 2003; Louw, 1997), the speech-language therapist needs to play a role in the education of parents and staff as well as in the direct intervention with the infants (ASHA, 2004; Billeaud, 2003; Rossetti, 2001). Collaborative speech-language therapy services to ensure comprehensive and coordinated ECI services, are crucial (ASHA, 2004). The ideal model of service delivery in South African is a transdisciplinary model since it supports community-based services in a context where various factors, such as a shortage of qualified staff, restrict services (Moodley et al., 2000). A collaborative team approach in a KMC programme will allow the speech-language therapist and audiologist to form partnerships with other health professionals and therefore facilitate access to infants at risk of communication delays (Fair & Louw, 1999).

It is important for the speech-language therapist involved in a KMC programme in a hospital to utilize this unique opportunity to provide parent education since the mothers are continuously available and caring for their infants. Providing information to caregivers in the beginning stages of postnatal attachment may possibly prevent later developmental delays (Kritzinger & Louw, 2003). The opportunity for ECI in the context of KMC needs to be utilized as developmental gains are greater when intervention starts as early as possible, resulting in more efficacious early intervention services (Louw, 1997; Moodley et al., 2000). It is, however, not clear what the content of such an early communication intervention programme should be and how the programme should be implemented and adapted according to the changing communication and feeding

developmental needs of the infant while receiving KMC. There appears to be a dearth of research on the earliest steps of communication development in high-risk infants, which should form the foundation of such a programme.

The research question can thus be formulated as follows: What are the characteristics of the communication developmental steps of high-risk infants receiving KMC in the presence of various other developmental subsystems, from admission to discharge from a KMC unit? If the research question can be answered, the results may be used as a basis to develop a scientifically based programme to train mothers to stimulate their infants' communication and feeding skills appropriately according to the neonates' developmental states.

## **1.4 DESCRIPTION OF TERMINOLOGY**

A brief description of the most important and relevant terms as used in the study is given below.

### **1.4.1 COMMUNICATION DEVELOPMENT**

Communication development is defined according to three stages of development, namely the prelocutionary, illocutionary and locutionary stages. In this study communication development refers to the prelocutionary stage, which includes pre-intentional or non-specific actions (e.g. crying) of the infant, interpreted by the mother as intentional. This includes components of interaction, attachment, play, pragmatics and gestures (Ogletree & Daniels, 1995; Owens, 1992; Rossetti, 2001).

### **1.4.2 HIGH-RISK NEONATES OR INFANTS**

For the purpose of this study high-risk neonates or infants can be defined as neonates or infants at biological and/or environmental risk of developmental delays and specifically communication developmental delays with specific reference to neonates or infants born prematurely and/or who are low birth weight (Rossetti, 2001; Widerstrom & Nickel, 1997). The terms neonate and infant are used interchangeably as both terms refer to

babies between the age of 0 to 12 months (neonate: 0 - 28 days and infant: 1 - 12 months) and the subjects observed for the purpose of this study fall within this age group (Harrison, 2002).

### **1.4.3 RISK FACTORS**

A risk factor is anything that interferes with an infant's ability to develop normally by means of interaction with the environment. The interference is a factor that contributes or is the potential cause of a developmental delay and specifically a communication developmental delay. Risk factors could be biological or environmental (e.g. maternal age, parents with developmental disabilities, poverty, HIV and AIDS epidemic) in nature. Biological risk factors may include an established risk factor (e.g. a genetic basis for a disorder) and/or an at-risk factor (e.g. prematurity, low birth weight) where the developmental outcome of the infant is not certain. Risk factors could also be related to the quality of familial, medical, therapeutic and educational care provided to the infant after birth (Rossetti, 2001; Widerstrom & Nickel, 1997).

### **1.4.4 PREMATURITY**

A premature infant can be defined as an infant born before the 37<sup>th</sup> week of gestation, in other words a fetus developing in an extra-uterine environment (Als, 1997; Rais-Bahrami, Short & Batshaw, 2002; Rossetti, 2001). Extreme prematurity refers to neonates born before the 30<sup>th</sup> week of gestation (Southgate & Pittard, 2001).

### **1.4.5 LOW BIRTH WEIGHT**

An infant that weighs less than 2 500g at birth is low birth weight. Different categories have been established according to birth weight, namely very low birth weight (weighing less than 1 500g at birth), extremely low birth weight (less than 1 000g birth weight) and micro-preemies which sometimes refers to an infant with a birth weight of less than 800g (Rais-Bahrami, Short & Batshaw, 2002; Rossetti, 2001).

#### **1.4.6 KANGAROO MOTHER CARE (KMC)**

KMC is defined as an intervention strategy for low birth weight and/or premature infants which includes three main components, namely skin-to-skin contact, exclusive breast feeding and early discharge from a hospital that provides support to both the caregiver and the infant (Bergman, 2004; Van Rooyen et al., 2002).

#### **1.4.7 DEVELOPMENTALLY APPROPRIATE CARE**

Developmentally appropriate care can be described according to two goals within the context of involving the family in the care of the high-risk infant:

- to keep detrimental environmental stimulation reduced
- provide opportunities for positive growth and development of the infant by protecting and enhancing the infant's physiological and behavioural functioning

(Willemse, 2000; Young, 1997).

#### **1.4.8 MOTHER-INFANT ATTACHMENT**

Mother-infant attachment is a mutual and personal process which occurs before and after birth between a mother and her infant, promoting an affectionate and devoted relationship between mother and infant which is aided by opportunities for the mother to see, touch, hold and take care of her infant (Allen, 1990; Rossetti, 2001; Willemse, 2000).

#### **1.4.9 MOTHER-INFANT INTERACTION**

Mother-infant interaction can be defined as an active reciprocal pattern of interaction during which mother and infant influence each other by means of behaviours such as mutual gaze, smiling, imitating, contingency, responsivity, synchrony and play (Allen, 1990; Rossetti, 2001; Wyly, 1995).

#### **1.4.10 EARLY COMMUNICATION INTERVENTION (ECI)**

ECI includes both assessment and treatment of infants, within the context of their families, who are at-risk of disabilities or delays involving communication, language, speech or prerequisite oral-motor behaviour, with the aim of establishing an interactive relationship between the infants and their environment (Louw, 1997; Rossetti, 2001).

## **1.5 CHAPTER OUTLAY**

The dissertation consists of five chapters and a description of each chapter is provided below.

### **1.5.1 CHAPTER 1 – PERSPECTIVES ON KANGAROO MOTHER CARE RESEARCH AND STATEMENT OF THE PROBLEM**

The different aspects and benefits of KMC for the high-risk infant and the need for speech-language therapy services in the context of a KMC programme are discussed as to provide a problem statement and rationale for this study. A solution is proposed to the speech-language therapist's involvement in a KMC programme by stating the research question to be investigated, and important and relevant concepts used in the study are defined. A description of the various chapters of the dissertation is also included.

### **1.5.2 CHAPTER 2 – DEVELOPMENT OF THE HIGH-RISK INFANT**

Different perspectives on the development of high-risk infants are discussed. The developmental perspective provides a basis from which it can be determined what knowledge still needs to be gained regarding neonatal development and specifically neonatal feeding behaviour and communication development in the context of a KMC programme.

### **1.5.3 CHAPTER 3 - METHOD**

This chapter consists of the ideas, rules, methods, techniques and approaches used to complete the study. The procedures used to arrive at the results of the study are clearly described as to facilitate the duplication of the study by other researchers.

### **1.5.4 CHAPTER 4 - RESULTS AND DISCUSSION**

This chapter presents the results of the study according to the sub-aims which were formulated to fulfil the main aim of the study. The results are discussed and interpreted against the background of related research, theoretical concepts and frameworks in the field of ECI.

### **1.5.5 CHAPTER 5 – CONCLUSION AND RECOMMENDATIONS**

The conclusion regarding each sub-aim is discussed by referring to initial orientations in chapters one and two. This chapter provides an honest answer to the research question and indicates the implication thereof.

## **1.6 CONCLUSION**

KMC has been established as best practice for the caring of high-risk infants as it aids the physiological and neurobehavioural development of these infants within a context that promotes mother-infant attachment as well as mother-infant interaction, which, in turn, contributes to positive developmental outcomes. The need for a collaborative approach in the management of these high-risk infants, which includes ECI services, has been established. Hence the need to describe the changing needs of these high-risk infants and their mothers during the implementation of KMC.

## **1.7 SUMMARY**

Chapter one describes the different aspects and benefits of KMC to high-risk infants, their mothers and the health-care system. A dearth of research regarding characteristics of feeding and communication development of infants in a KMC programme and the role of the speech-language therapist in such a programme can be resolved by conducting the empirical study. The need for a description of these high-risk infants and their mothers' changing needs according to the infants' development in different developmental subsystems and the influence of the developmental areas on infant communication development and feeding behaviour have been justified. A description of important and relevant concepts used in the study is provided as well as an outlay of the chapters included in the dissertation.

## CHAPTER 2

### DEVELOPMENT OF THE HIGH-RISK NEONATE

***Aim:** To describe recent research findings on the earliest developmental stages of high-risk neonatal development in order to obtain insight into the different theoretical perspectives regarding high-risk neonatal development. The theoretical basis will provide a knowledge base for the empirical study to investigate neonatal development as it takes place within a KMC programme with specific reference to neonatal communication and feeding development.*

#### 2.1 INTRODUCTION

Knowledge of and insight into the development of high-risk neonates has become increasingly important for health-care workers in the South African context. This is true due to an improved survival rate of premature and/or low birth weight infants (Hack, 2001; Rossetti, 2001). Therefore speech-language therapists need a sound theoretical basis regarding neonatal development from which to develop strategies to prevent and minimize communication delays and disorders in children (Barnard, Morisset & Spieker, 1993). One such strategy would be to provide effective ECI services within the health-care system at the earliest possible stage. Premature and/or low birth weight neonates provide the earliest developmental stage at which direct ECI services can be initiated.

However, a challenge arises when these premature and/or low birth weight neonates receive care within a KMC programme which traditionally would have been exclusive care within a NICU (Power, 2002; Van Rooyen et al., 2002). The challenge pertains to the role of the speech-language therapist in a KMC programme with limited knowledge regarding neonatal communication development and the development of neonatal feeding behaviour while the infant receives the benefits of KMC.



Since the aim of the empirical study is to provide a description of neonatal development in the context of a KMC programme, with the focus on communication and feeding behaviour from an ECI perspective, it is necessary to establish a clear understanding of available literature on neonatal development. The literature overview regarding the implementation of KMC led to the conclusion regarding the dearth of research on neonatal communication development and the development of neonatal feeding behaviour in the context of a KMC programme. Consequently chapter two aims to describe neonatal development, independently from the KMC context, with specific reference to the areas of knowledge the speech-language therapist requires to describe neonatal development in the context of a KMC programme.

Figure 1 was compiled to provide a framework of the essential theoretical components described in chapter two, to form the knowledge base required of the speech-language therapist regarding neonatal development as it takes place within a KMC programme.

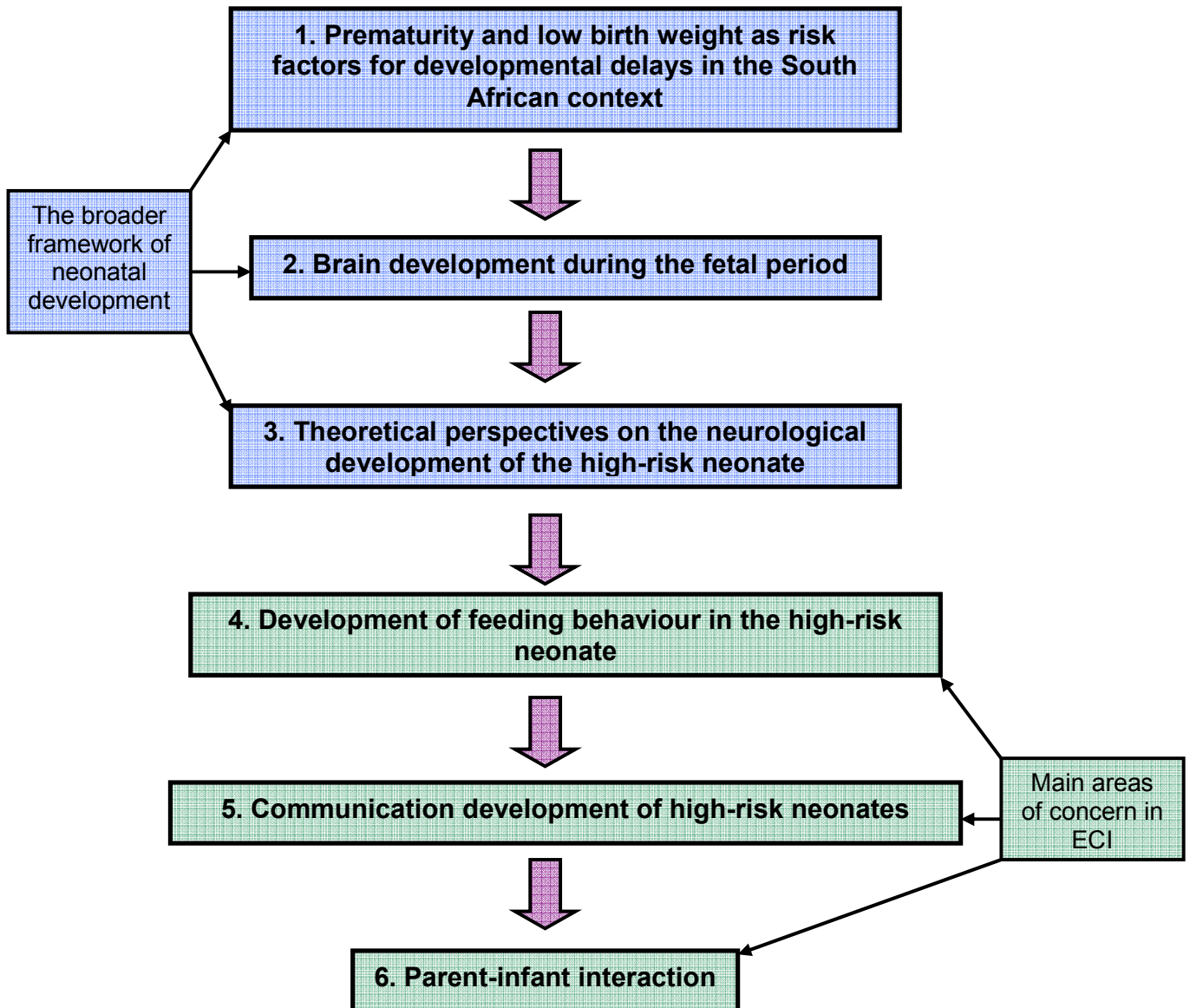


Figure 1. Knowledge base required for the description of neonatal development within a KMC programme

## 2.2 PREMATURETY AND LOW BIRTH WEIGHT AS RISK FACTORS FOR DEVELOPMENTAL DELAYS IN THE SOUTH AFRICAN CONTEXT

The low birth weight rate in South Africa is two to three times higher than in developed countries, indicating a population characterized by poverty (Pattinson, 2002). Therefore it is important for the speech-language therapist to be aware of the presence of interacting

biological and environmental risk factors of prematurity, low birth weight, poverty and HIV and AIDS and their possible influence on the developmental outcomes of high-risk neonates (Kritzinger, 2004).

Birth weight and gestational age are the most common indicators of the high-risk status in an infant and these two biological risk factors have also been associated with later developmental delays (Rossetti, 2001; Widerstrom & Nickel, 1997). Premature and/or low birth weight neonates not only present with risks for social, cognitive, motor and behavioural disorders (Robinson & Gonzalez, 1999; Young, 1997), but also display an increased risk for communication disorders (Rossetti, 2001) including delayed pre-linguistic communication development and delayed receptive and expressive language development (Brown & Ruder, 1995; Gonzalez & Robinson, 2001; Sherman, Shulman, Trimm & Hoff, 1996). The neural bases of communication development in early childhood are, however, not only vulnerable to biological risk factors but also to environmental risk factors (Prizant, Wetherby & Roberts, 1993). Environmental factors such as the impoverished quality of the child-rearing environment, the limited responsiveness and involvement of caregivers and ongoing neglect may influence an infant's communication development (Prizant et al., 1993). These factors are often associated with poverty which may also be characterized by factors such as malnutrition, inadequate health care, exposure to infectious diseases, unsafe living conditions and insufficient educational opportunities (Benn, 1993; Thompson, 1992; Prizant et al., 1993). Poverty in and of itself does not necessarily cause developmental problems in young children but the conditions associated with poverty in families are most definitely a high risk for adverse developmental outcomes in the children (Thompson, 1992; Prizant et al., 1993). It is clear that infants in the South African context are often exposed to both biological and environmental risk factors, placing these infants in a doubly vulnerable position (Benn, 1993; Thompson, 1992).

Premature and/or low birth weight neonates also present with a high risk for sensorineural and/or conductive hearing loss (Bess, 1993; Lasky, Wiorek & Becker, 1998; Pruszewicz & Pospiech, 2001). The increased risk of NICU graduates for acquired hearing loss is

also associated with the administration of ototoxic drugs, ambient incubator and other noises and perinatal complications such as hypoxia and hyperbilirubinemia (Roizen, 2003; Van Naarden & Decouflè, 1999). Another important risk factor that may predict later communication difficulties is the risk for premature and/or low birth weight neonates to experience or develop feeding difficulties (Arvedson & Brodsky, 2002; Hall, 2001; Rossetti, 2001). These feeding problems are often associated with neonates' immature postural tone, respiratory function and structural alignment and extended periods of artificial methods of feeding (Arvedson & Brodsky, 2002; Benoit, 1993).

Communication and/or feeding problems also create a risk for atypical social development, behavioural problems and emotional problems which in turn may have a detrimental effect on parent-infant interaction and family life (Benoit, 1993; Billeaud, 2003). It is therefore important for the speech-language therapist to be aware of the interrelatedness and complexities of prematurity and low birth weight and environmental risk factors on communication development in the South African context.

Knowledge regarding risk status for communication development will allow the speech-language therapist to develop and implement strategies to increase infants' protective factors against developmental delays (Werner, 2000). "If we want to see that children achieve their potential, we must develop programs that decrease the risk factors for bad outcomes and promote protective factors in their lives" (Barnard et al., 1993:386). Speech-language therapists will only be able to promote protective factors for high-risk infants when they gain insight into the brain development of neonates at the earliest stages, and the implications of extra-uterine environmental factors.

### **2.3 BRAIN DEVELOPMENTAL PROCESSES DURING THE FETAL PERIOD**

Knowledge regarding the neurological development of high-risk neonates provides a basis for determining their neurodevelopmental needs (Als, 1999). As medical and developmental problems due to premature birth may be related to the immature neonate's

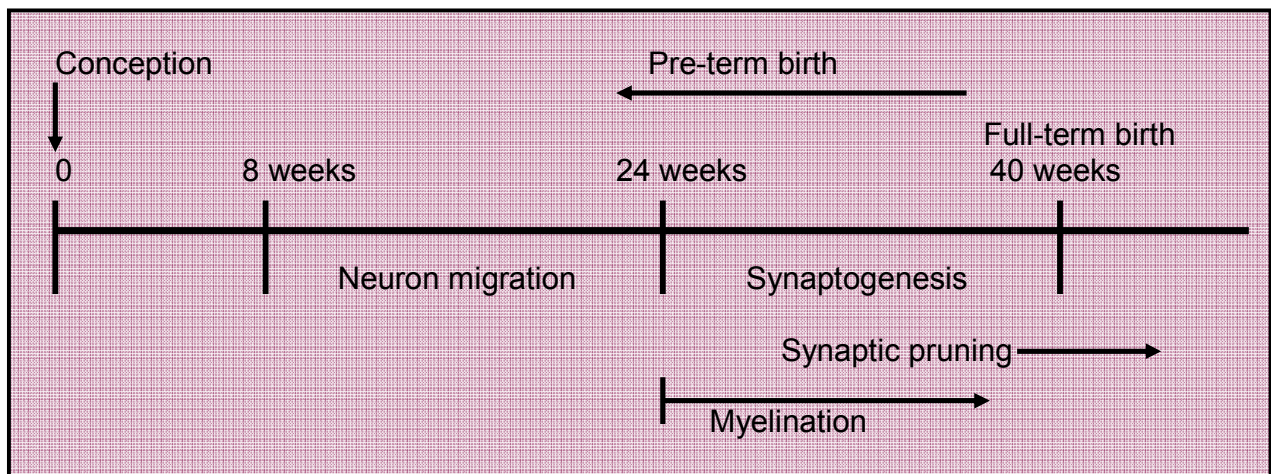
inability to adapt to the extra-uterine environment (Blanchard, 1995), it is vital for speech-language therapists to match their intervention strategies with the neonate's neurological developmental level.

Brain development during the fetal period is a complex process which is characterized by the germinal matrix releasing cortical neurons, as many as 100, 000 cortical neurons per day, which migrate through the cortex to a specific location. This migration begins at around eight weeks gestation until 24 weeks gestation where after neuronal maturation and organization increases remarkably (Als, 1999; Nelson, 2000).

Following migration each neuron develops dendritic and axonal interconnections yielding numerous synapses. As the cells increase in size and become more extensively connected, sulci and gyri on the surface of the cortex also increase while different areas in the brain organize for different functions. Acceleration of brain growth pertaining to an increase in weight and change in head contour takes place in correlation with an increase in the number of gyri at the end of the second trimester, i.e. at 26 weeks gestational age (Als, 1999). Since infants born at 23 weeks gestation are now surviving (Als, 1999; Rossetti, 2001) migration, maturation and organization of cortical neurons may take place in an unexpected extra-uterine environment as the neonate's brain development enters the period of synaptogenesis (Als, 1999; Scher, 2001). The process of synaptogenesis is characterized by immense networks of neuronal interconnections which are formed by patterns of electrical activity. The synaptic network is refined according to use during later infancy (Aucott, Donohue, Atkins & Allen, 2002). Another process which forms part of synaptogenesis and starts later in gestation and continues postnatally is pruning of excess synapses. Synaptic pruning involves the elimination of synapses which have not been connected or have connected abnormally (Nelson, 2000).

The process of myelination which starts from 24 weeks gestational age is an important developmental process that allows rapid and repetitive conduction of impulses through chemical neurotransmitters. The sensitivity of receptors for specific neurotransmitters in various regions of the brain vary and are influenced by different experiences such as

visual, auditory, kinaesthetic, olfactory and taste experiences (Als, 1999; Nelson, 2000). An interdependency between the brain and sensory organs exists which is necessary for the structural and functional development of the brain (Als, 1999). Hence the implementation of KMC as a developmentally appropriate intervention strategy to promote appropriate opportunities for development and reduction of detrimental stimuli to decrease the stress on the neonate's sensitive central nervous system (Young, 1997). Reducing stressful and/or harmful experiences on the neonate's central nervous system is especially important as the premature neonate is born during synaptogenesis and the myelination processes which should take place in the ideal environment of intra-uterine feeding and protection against excessive stimulation and infections. The balance between nutrition and protection is disturbed when the neonate is born in the most fragile period of brain development, i.e. between 26 and 40 weeks of gestation, while the most active period of neural organizational events begin (Als, 1999; Blanchard, 1995).



**Figure 2. Timeline of major processes of fetal brain development**

As neuron migration commences at eight weeks gestation until 24 weeks gestational age and synaptogenesis and myelination takes place from 24 weeks gestational age and continues postnatally it is clear that the neurological development of the neonate is a sequential and overlapping process (Als, 1999; Nelson, 2000; Scher, 2001) which is very sensitive to the extra-uterine environment. Direct and indirect brain insults could be the consequence of a mismatch between the neonate's central nervous system's ability to

adapt to the extra-uterine environment, which should actually develop within an intra-uterine environment (Blanchard, 1995). The potentially harmful NICU environment is emphasized when it is compared to the ideal intra-uterine environment which is ideal for the development of the fetus.

Although the fetus in utero is exposed to external environmental sounds and sounds generated by the mother (e.g. heart beat, respiratory sounds, voice), all these sounds are attenuated. Visual input is limited to a dim red glow and the amniotic fluid eliminates the effect of gravity, thereby facilitating random movements. The boundaries of the uterus provide deep proprioceptive and vestibular input as the fetus moves (Sheahan & Brockway, 1994). Contrary to the ideal environment of the uterus the NICU is characterized by constant noise, bright light, adverse tactile input and abnormal proprioceptive feedback due to the influence of gravity and a lack of the intra-uterine boundaries (Sheahan & Brockway, 1994).

Contrary to the NICU environment KMC fosters neurobehavioural development and therefore acts as a neuro-protective technique (Ludington-Hoe & Swinth, 1996) against the adverse effects of the extra-uterine environment on the neonate's developing central nervous system. Neurobehavioural development is fostered by giving attention to the neonate's behavioural cues and consequently changing the environment to increase the neonate's self-regulatory behaviours and resulting in a decrease of stress behaviours (Blanchard, 1995). Knowledge regarding fetal brain development provides a foundation for the speech-language therapist to promote a KMC programme's neuro-protective characteristics, within the framework of ECI, by investigating the changing developmental needs of the neonate, in terms of communication abilities and feeding behaviour.

## **2.4 THEORETICAL PERSPECTIVES ON THE NEUROLOGICAL DEVELOPMENT OF THE HIGH-RISK NEONATE**

A great challenge in neonatal care is to determine the neurodevelopmental consequences of interventions applied to specific neonates and their families (Aucott et al., 2002). The consequences of care, applied by all disciplines involved with neonatal intervention, including speech-language therapists need to be considered. Theoretical perspectives relating to stages of neonatal development, neurodevelopmental systems, and neurobehavioural development are therefore presented to provide a theoretical basis for understanding neonatal development. These specific theoretical perspectives are chosen as speech-language therapists require insight into neonatal behavioural cues which are directly related to the neonate's developmental stage, sensory input from the environment and the neonate's ability to process input from the environment (Als, 1999; Wyly, Pfalzer & Speth, 1995; Young, 1997).

Consequently, three different perspectives on neonatal development will be described. Gorski's theory on neonatal development describes three basic states which include the in-turned state (physiologic state), coming-out state (beginnings of organized behavioural responsiveness) and reciprocity state through which the neonates move as they progress from illness to health (Gorski, Davison & Brazelton, 1979; Rossetti, 2001). Progression through every state also depends on the neonate's gestational age, with the in-turned state present before 32 weeks gestational age, the coming-out state at approximately 32 to 35 weeks and the reciprocity state from 36 weeks gestational age (Gardner & Goldson, 2002). Behavioural cues of the neonate will change depending on the influence of the environment on the neonate within the context of the specific developmental state (Wyly et al., 1995).

The in-turned state is when neonates develop sufficient physiological integrity to support themselves in order to use environmental stimuli to aid developmental progress (Gorski et al., 1979). During the coming-out state neonates can already utilize their capacity to



control and maintain their physiological systems by responding more actively to environmental stimuli. During this state of potential vulnerability it is critical that the care-giving environment adapts to the neonate's behavioural cues as to foster physical and social-interactive development (Gorski et al., 1979). Lastly, the reciprocity state is characterized by the developing relationship between parents and infant as the infant responds to the caregiver's behaviour in a specific and predictable way (Gorski et al., 1979).

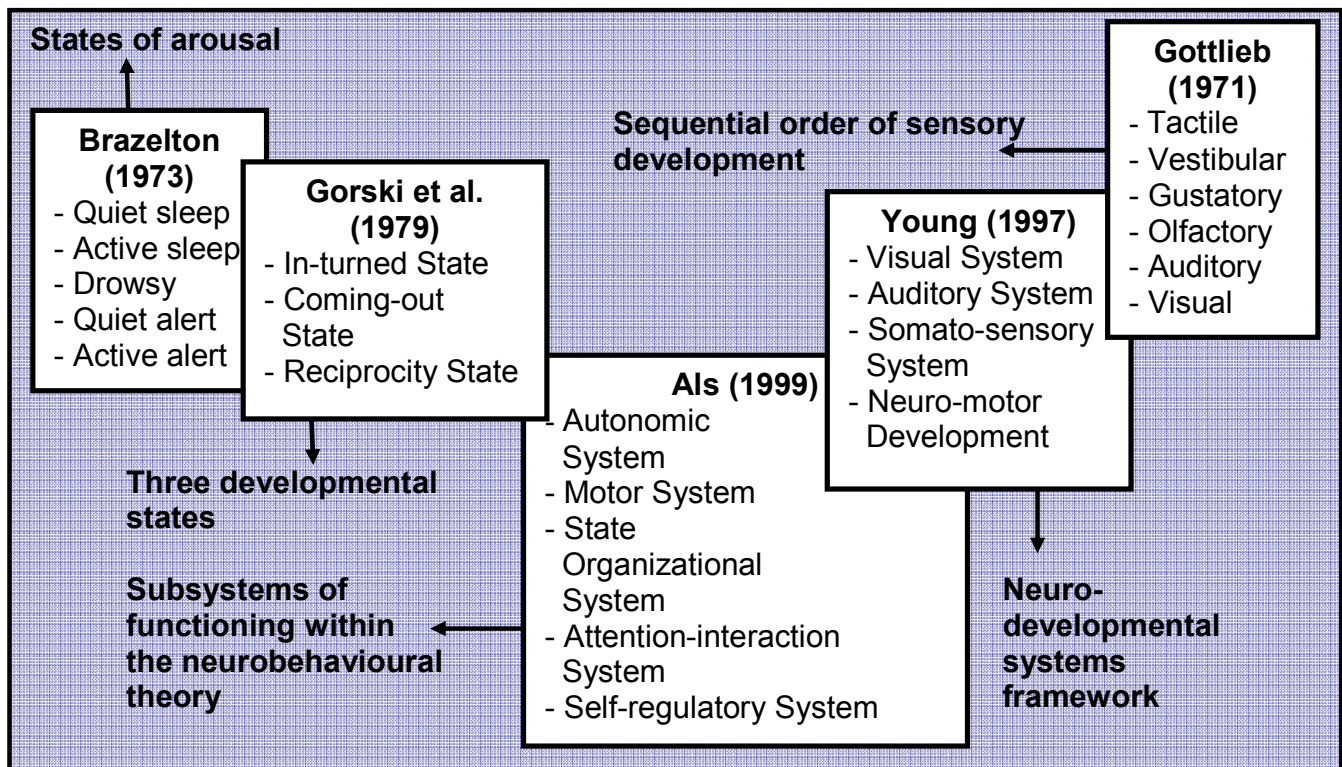
During every developmental state, cyclic periods of active and quiet behaviour can be identified for every neonate. The periods of rest and activity develop until they are distinguishable states at 32 weeks gestational age (Wyly, 1995) and include the quiet sleep, active sleep, drowsy, quiet alert, active alert and crying states (Brazelton, 1973). The periods of rest and activity can be used to determine the neonate's level of arousal which provides the foundation for interaction between the neonate and the environment. The nature and amount of environmental input given to and utilized by the neonate is determined by the neonate's state, which is an indication of central nervous system maturation (Brazelton, 1973; Willemse, 2000; Wyly, 1995).

Although the different states of alertness within the different developmental states indicate central nervous system maturation, it appears that Gorski et al. (1979) only described the observable behaviour of the neonate. No link was made between the developmental states of the neonate and the various sensory systems within the neurodevelopmental system. A more comprehensive perspective on high-risk neonatal development was proposed by Young (1997) who described neonatal development within a neurodevelopmental systems framework. The neuro-motor system develops through input received from the various sensory systems namely the somato-sensory system, auditory system and visual system in a chronological order. The order of sensory development is sequential and occurs as follows: tactile, vestibular, gustatory, olfactory, auditory and lastly visual (Gottlieb, 1971). These sensory systems need to be stimulated in the correct order at the right time to compensate for the neonate's neurological immaturity (Willemse, 2000). It appears that the neurodevelopmental systems theory (Young, 1997) only provides a

limited perspective on neonatal development as the various sensory systems are described separately from one another. Although Young (1997) refers to Als's synactive theory of development (Als, 1999) and the importance of neuro-motor development, the processing and integration of sensory information is not described.

According to Als's neurobehavioural theory, known as the synactive theory of development (Als, 1999), the focus is on neonatal information processing and the systems responsible for information processing. Synactive can be described as referring to the constitutive parts of a whole. According to *The Concise Oxford Dictionary* (1990) syn means with, together or alike, while active may refer to a dynamic process of interaction between the different physiological and behavioural systems that occur during the pre-term infant's brain development (Nelson, 2000). The synactive theory integrates Gorski's (Gorski et al., 1979) and Young's (Young, 1997) perspectives on neonatal development in an expansive theory of neurobehavioural development (Als, 1999). The theory focuses on the integration of physiological and behavioural systems which influences the neonate's reaction to the environment (Willemse, 2000). According to Als (1999), five systems of functioning may be described, namely the autonomic system, motor system, state organizational system, attention-interaction system and the self-regulatory system of the neonate. Within each of Gorski's (Gorski et al., 1979) developmental states Als's (Als, 1999) subsystems of functioning interact with each other as the neonate interacts with the environment (Willemse, 2000). The subsystems support and influence each other and disorganization in one system will influence the organization in other systems (McInroy & Kritzinger, 2005; Willemse, 2000). Consequently, an intervention approach was developed based on the neonate's behavioural cues using strategies such as minimal handling, reduction in excessive environmental stimulation, promotion of state control and self-regulation, and use of appropriate positioning to adhere to the developmental needs of the neonates (Bennett, 1995).

In order to systemize the various theoretical perspectives on pre-term neonatal development Figure 3 was compiled.



**Figure 3. Theoretical perspectives on pre-term neonatal development**

Each of the theories in Figure 3 contribute to the understanding of pre-term neonatal development by providing an indication of the developmental states pre-term neonates may progress through (Gorski et al., 1979). The different states of arousal a pre-term neonate may experience (Brazelton, 1973), determine the nature and amount of stimulation the neonate can utilize. Insight into the theoretical perspectives on neonatal development may foster sensitivity to the order in which a pre-term neonate’s sensory systems develop and an awareness of neonates’ behavioural cues in response to their environment (Als, 1999; Gottlieb, 1971).

Although an overview of the various theoretical perspectives may increase speech-language therapists’ insight into pre-term neonatal development it is necessary to integrate the knowledge regarding neonatal development with neonatal communication and feeding behaviour. The theoretical perspectives therefore provide a basis for the

empirical study to describe neonatal communication development and feeding behaviour as it takes place in the context of a KMC programme.

## **2.5 DEVELOPMENT OF FEEDING BEHAVIOUR IN THE HIGH-RISK NEONATE**

“Breathing and eating are the most basic physiologic functions that define life’s beginning outside of the mother’s womb for newborn infants” (Arvedson & Brodsky, 2002:3). Within the framework of neonatal development of physical and emotional maturity a complex series of events that coordinate neurological, respiratory and gastrointestinal systems need to take place to ensure effective sucking and swallowing (Arvedson & Brodsky, 2002). Successful feeding in the high-risk neonate is of paramount importance as it forms the foundation for general development, communication skills, psychosocial welfare and somatic growth. Any disturbance in the neonate’s ability to feed successfully may have far-reaching consequences for the neonate’s normal developmental progress and may result in malnutrition, behavioural difficulties and severe stress for the family and infant (Arvedson & Brodsky, 2002; Billeaud & Broussard, 2003).

Suckling and sucking are described as two distinct phases in development of feeding behaviour. Suckling develops in the second and third trimesters beginning at approximately the 18<sup>th</sup> to 24<sup>th</sup> week of gestation. Sucking only develops at around six months of age (Arvedson & Brodsky, 2002). There are distinct similarities and differences between the suckle and suck patterns. The similarities include the up and down movement of the tongue and jaw to create pressure which is required to express liquid and draw it into the mouth. In both patterns the sides of the tongue move upward to form a central groove which facilitates the formation of a bolus and the movement of the bolus posteriorly over the back of the tongue. The primary difference between the two patterns is the movement of the tongue and the degree of lip closure (Arvedson & Brodsky, 2002). Suckling is characterized by a backward and forward movement of the tongue with the backward movement being more prominent and approximation of the lips may be loose (Arvedson & Brodsky, 2002; ASHA, 2004). In contrast, the sucking pattern

is characterized by an upward and downward movement of the tongue, smaller vertical movements of the jaw and firmer approximation of the lips (Arvedson & Brodsky, 2002). The focus will, however, be on the suckling pattern as it represents the first developmental feeding pattern.

By 34 weeks gestation fetuses can suckle and swallow well enough to successfully meet their nutritional needs via oral feeding. Some neonates can coordinate the different subsystems sufficiently to start with oral feeding at 32 to 33 weeks gestation which is in the coming-out developmental state (Arvedson & Brodsky, 2002; Gorski et al., 1979). A very important prerequisite for efficient feeding is the accurate timing and coordination of suckling, swallowing and breathing, which must act together as a triad of functions within a sequence (ASHA, 2004; Wolf & Glass, 1992). Suckling is needed to form a bolus in the oral cavity which in turn functions as a stimulus to initiate swallowing. Swallowing on the other hand suppresses respiration as each swallow interrupts the respiratory cycle for approximately one second. Therefore, a change in the breathing pattern occurs during feeding. An interaction also exists between breathing and suckling which is especially significant for the infant with respiratory problems as the initial suckling phase will have to be interrupted to provide opportunity to breathe (Wolf & Glass, 1992). It is clear that an interrelationship exists between suckling, swallowing and breathing which forms the basis for normal feeding in the pre-term neonate.

The pre-term neonate progresses through developmental stages during which the suckling and respiratory patterns are still maturing. As the neonate develops nutritive and non-nutritive suckling become more rhythmic and a greater stability in the length and pauses of bursts develop (Wolf & Glass, 1992). Physiologic stability and rhythmic non-nutritive sucking are prerequisites for efficient oral feeding (Arvedson & Brodsky, 2002; Wolf & Glass, 1992). It is also important for the infant to be in a calm state during feeding since readiness for oral feeding is associated with the infant's ability to come into and maintain awake states (Arvedson & Brodsky, 2002; ASHA, 2004). It is therefore important for the speech-language therapist to be aware of the neonate's developmental state and

accordingly implement appropriate intervention strategies to aid the development of successful suckling skills.

In the context of a KMC programme which encourages exclusive breast feeding, improves readiness for oral feeding and fosters parent-infant interaction (Anderson et al., 2004; ASHA, 2004; Feldman, 2004; Feldman et al., 2002; Hann et al., 1999; Hurst et al., 1997), it is crucial for the speech-language therapist to determine how neonatal feeding skills develop within the broader framework of neonatal development. The speech-language therapist's role in terms of feeding intervention is emphasized as feeding is a major activity which occurs repeatedly throughout the day. The feeding activity provides learning opportunities for the infant and parent as they coordinate their actions to meet the nutritional needs of the infant (Humphry, 1995). Not only does every feeding experience contribute to the developing relationship between infant and parent but the vegetative functions of the oral mechanism also antedate the development and form the foundation for later oral communication functions (Billeaud & Broussard, 2003; Humphry, 1995).

As neonatal feeding behaviour and communication development are specialist areas for speech-language therapists (ASHA, 2004; Rossetti, 2001) therefore the empirical study provides the opportunity to describe neonatal feeding behaviour and communication development as it takes place within the dyad of mother-infant interaction in the context of a KMC programme. Due to the interrelationship between neonatal feeding behaviour, mother-infant interaction and neonatal communication development an overview on neonatal communication development is presented.

## **2.6 COMMUNICATION DEVELOPMENT OF HIGH-RISK NEONATES**

When caregivers interpret and respond to an infant's behaviour, the infant's behaviour serves as a function of communication. These behaviours include vocalizations, facial expressions, body posture and even skin colour. Information communicated includes the

infant's state of comfort or distress, interest in the environment and readiness to engage in interaction (Brazelton, 1973; Prizant et al., 1993). Caregiver responses should include attempts to comfort the infant, provide appropriate types and levels of stimulation and fulfil the infant's tangible needs such as feeding and changing (Prizant et al., 1993). In this dyadic relationship the infant's behaviour should therefore have a systematic effect on the caregiver (Ogletree & Daniels, 1995). If not, preventative intervention can be implemented by the speech-language therapist as part of an ECI programme.

Knowledge regarding communication development within a dyadic relationship is important as the pre-term neonate moves toward the prelinguistic period of communication development which is a significant period of communicative growth (Ogletree & Daniels, 1995). Intentional communication is an acquired social skill which develops as the caregiver interprets the infant's behaviour from birth, during which the infant learns rules and procedures for successful interactions. Neonates have innate aspects of emerging intentionality which includes the preference for human faces and high-pitched voices, the presence of consistent sound patterns in their cries, alerting to human holding, quieting when picked up and rocked, orienting to smell and the infant's ability to follow the caregiver's line of regard (ASHA, 2004; Kalmanson & Seligman, 1995; Ogletree & Daniels, 1995). This emphasizes the need of caregivers to foster the neonate's development of social interactive behaviour within the communicative dyad by creating opportunities for communication during which the infant's behaviour is interpreted as meaningful (Ogletree & Daniels, 1995).

The question arises regarding the neonate's communication development at the very beginning stages of the premature neonate's development in the NICU and in the context of a KMC programme. According to a single case study of a high-risk neonate's communication development in a NICU it appeared that the neonate displayed precursors of language content as early as 31 weeks gestational age (McInroy & Kritzing, 2005). The precursors observed in the extra-uterine environment were reflexive reactions to sound at 31 weeks gestational age. Thereafter, at approximately 33 weeks gestational age the neonate displayed precursors of language form which was characterized by

differentiated crying, crying in a reaction to other neonates' crying and sounds of discomfort. The same study found that precursors of language use or communication interaction progressed so that the infant could establish eye contact, regulate its own behaviour, accept cuddling and habituate to repetitive stimuli at the gestational age of 36 weeks. The neonate's sequential steps of communication development reflects Gottlieb's (1971) theory on sequential sensory development as the neonate's auditory system seemed to develop prior to the neonate's visual system. The precursors of communication interaction therefore increased and became more complex as the neonate's state of alertness changed in accordance with the progression through the in-turned, coming-out and reciprocity states (Gorski et al., 1979).

The single case study therefore provides evidence that precursors to communication interaction may be present from the age of 31 weeks gestational age within the context of a NICU (McInroy & Kritzinger, 2005). However, neonatal communication development in the context of a KMC programme, which provides an ideal environment for mother-infant interaction (Van Rooyen et al., 2002), appears to be unknown. The empirical study therefore aims to describe neonatal communication interaction as it develops from mother-infant attachment in a KMC programme.

## **2.7 PARENT-INFANT INTERACTION**

In the beginning stages of an infant's development the dominant partner in the dyadic relationship is the parent. Parents need to structure actions and initiate events during which they mediate sensory input as the infant cannot escape excessive stimulation and can only take note of the sounds and sights that are nearby. Therefore, parent-infant interaction creates a context through which the infant experiences the world (Barnard, 1997).

According to McInroy and Kritzinger (2005) it appeared that the participant's ability to establish interaction with its environment increased, while mother-infant interaction showed little change over time. It appeared that the caregiver did not interpret the infant's



behaviour changes and did not use opportunities for communication interaction, which indicated inappropriate and ineffective mother-infant interaction. A mismatch between the neonate's increased ability to establish interaction with its environment and the mother's interaction with the neonate was observed. Both an increase in state of alertness and precursors of communication interaction, which seem to be related to the development of the sensory systems, should have encouraged an increase in the frequency and complexity of mother-infant interaction. The mother therefore required assistance to interpret these subtle changes in her infant's behaviour as attempts to communicate (McInroy & Kritzinger, 2005).

The quality of parent-infant interaction is important for developmental outcomes of the infant and has been linked to improved intellectual and language abilities, especially for infants at risk (Aydlett, 1995; Barnard, 1997; Comfort & Farran, 1995; Poulsen, 1995). Parent-infant interaction may contribute to the infant's development when the following nine characteristics are present: (1) attention; (2) synchrony; (3) symmetry; (4) contingency; (5) affect; (6) entrainment; (7) verbal behaviour; (8) play and (9) autonomy (Barnard, 1997; Rossetti, 2001). Attention refers to the amount, type and timing of attention the parent and infant direct toward each other (Barnard, 1997). The parents need to adapt their behaviour according to the infant's rhythms which results in synchrony between parent and infant during which parents identify the infant's threshold for stimulation, i.e. recognize the infant's interaction styles, preferences for interaction and capacity to give attention. Contingency takes place when the parents realize that their desire to interact with the infant depends largely on the infant's mutual desire to interact (Rossetti, 2001). The contingent pattern of communication during which the infant listens to parents when they speak, is an important key to parent-infant interaction (Barnard, 1997). Affect involves both partners in the dyadic relationship and emotions, feelings or mood are expressed in a non-verbal and/or verbal way (Barnard, 1997).

When both parent and infant have established a rhythm of interaction they have reached the level of entrainment (Rossetti, 2001). Talking to the infant stimulates the infant's attention and fosters socio-emotional and cognitive growth (Barnard, 1997). Verbal

behaviour can be expressed during play when pleasurable, repetitive patterns of interaction take place during which infants learn they can have more control over their caregivers (Rossetti, 2001). Lastly autonomy develops over time when infants become more aware of the control they have over the interactions taking place with their parents (Rossetti, 2001).

The characteristics of parent-infant interaction are, however, often not present or completely intact during interaction with a premature and/or low birth weight neonate. This could be due to a number of factors. Firstly parents mourn their loss of the “normal” infant they did not have while they have to meet the demands of their new sick neonate (ASHA, 2004; Minde, 1993). Interaction with the premature and/or low birth weight neonate may also be influenced by parents’ stressful experience of caring for their neonate in the NICU (Willemse, 2000). In the NICU where the neonate’s medical needs are met, parents are overwhelmed with feelings of hopelessness due to their inability to fulfil their role as parent (Minde, 1993; Moehn & Rossetti, 1996). Mothers of premature infants also demonstrate continuous anxiety and low confidence in their care-giving abilities which is exasperated by the premature neonates’ inability to process information (Minde, 1993). The inability to process information results in neonates being easily disorganized in their overall behaviour which may be interpreted as the neonate being hypo-reactive to stimuli and handling resulting in excessive stimulation by the mother (Minde, 1993). The excessive stimulation in turn may cause the neonate to change from hypo- to hyper-activity which leaves the parents unsure of how to stimulate their infant appropriately (Minde, 1993). It is therefore often difficult to interpret the pre-term infant’s behaviour making the parents’ role in responding appropriately to the infant even more difficult and more important (McCollum & Yates, 1995). The role of the professional and specifically the speech-language therapist is therefore to assist the parents in getting to know their infant (McCollum & Yates, 1995). Parent-focused intervention should attempt to train parents to recognise their neonate’s stress and stability signals (Bennett, 1995) with the aim of establishing optimal parent-infant interaction.

Speech-language therapy services will therefore endeavour to promote the family's ability to: (1) understand, respond to and encourage communicative interactions between themselves and the infant; (2) facilitate and promote the infant's physical development to support various communicative functions; (3) create opportunities for cognitive development; (4) support any special care needed by infants due to their condition; (5) monitor changes in infants' physical and behavioural status and report it to the relevant health-care professional (Billeaud, 2003). Knowledge regarding the development of normal parent-infant interaction and insight into the speech-language therapy services which can promote mother-infant interaction should promote family centred ECI. However, effective ECI services can only be facilitated by gaining insight into mother-infant interaction as it takes place in a specific context. Utilizing the theoretical orientation regarding parent-infant interaction the empirical study will describe pre-term mother-infant interaction as it takes place in the context of a KMC programme.

## **2.8 CONCLUSION**

When considering the development of high-risk neonates in any context the professional person needs to take into account the neonates' interaction with their immediate social environment which is displayed as a set of processes, events and relationships (Garbarino & Ganzel, 2000). The speech-language therapist therefore needs to be aware of the neonate's developmental level to facilitate appropriate intervention strategies that fosters the neonate's neurobehavioural development.

Chapter two accordingly provides a description of neonatal development to establish a theoretical foundation for the description of neonatal development in the context of a KMC programme. Specifically the description of neonatal communication development in a context which promotes mother-neonate interaction (Feldman et al., 2002). By means of six different areas relating to neonatal development it has been established what speech-language therapists' knowledge base should be in the field of ECI pertaining to premature and/or low birth weight neonates. The theoretical orientation regarding neonatal development serves as point of departure for the investigation of neonatal

communication development and feeding behaviour, from a speech-language therapy perspective, as it takes place within the mother-infant dyadic relationship in the context of a KMC programme. If this question regarding neonatal communication development and the development of neonatal feeding behaviour in the context of a KMC programme can be answered, it will guide speech-language therapists to effectively integrate their ECI services into a KMC programme.

## **2.9 Summary**

Chapter two provided a description of neonatal development with specific reference to prematurity and low birth weight as risk factors for developmental disorders in the South African context. A description of fetal brain development and different perspectives regarding the neurological development of high-risk neonates followed. A theoretical overview on neonatal communication development, the development of feeding behaviour and parent-infant interaction was presented as it forms a pivotal part of neonatal development and ECI strategies applied to high-risk neonates. Consequently the chapter provided a basis for speech-language therapists to regard neonatal communication development and the development of feeding behaviour in the light of general neonatal development. This perspective will assist the investigation of neonatal communication development in the context of a KMC programme. Once again the dearth in research regarding neonatal communication and feeding development in the context of KMC was identified.

## CHAPTER 3

### METHOD

*Aim: To describe the ideas, rules, methods, techniques and approaches used to execute the study. The procedures used to arrive at the results of the study are clearly described in order to demonstrate trustworthiness, the ethical considerations in the implementation of the study and to facilitate the duplication of the study by other researchers.*

#### 3.1 INTRODUCTION

By means of an in-depth literature review the numerous benefits of KMC to high-risk neonates, their mothers and the health-care system have been discussed. Furthermore, a description of neonatal development with specific reference to neurological development, theoretical perspectives regarding neonatal development, the most prominent South African risk factors that influence neonatal development and feeding and communication development of high-risk neonates have been presented. The review provides a basis for the speech-language therapist to gain insight into neonatal development and the influence of KMC on the mother-infant dyad. The need for a collaborative approach in the management of high-risk infants within a KMC programme, which includes ECI services, has also been established.

Due to a dearth of research regarding characteristics of feeding and communication development of infants in a KMC programme and the role of the speech-language therapist in such a setting, the question arises regarding neonatal communication development as it takes place within the context of a KMC programme. Therefore, this empirical descriptive survey is conducted to provide a description of high-risk infants' and their mothers' changing needs according to the infants' development in various developmental subsystems.

### **3.2 AIMS**

The main aim of this study was to observe and describe the early communication development of a group of high-risk neonates from admission to discharge from a KMC unit.

The aim was to observe and describe the following aspects regarding neonatal development from the time of admission to a KMC programme to the time of discharge from the KMC unit:

- The perinatal characteristics and medical care of the group of neonates.
- The different states and state transitions of the neonates and their ability to establish organized behaviour.
- The development of neonatal feeding skills.
- The different components of neonatal communication development.
- The process of mother-neonate communication interaction.
- The KMC unit environment in terms of lighting and noise levels

### **3.3 RESEARCH DESIGN**

An empirical descriptive research design in the form of a survey was used for this study. The descriptive survey was done by observing 25 neonates over time in the natural setting of a KMC ward from admission to discharge from the ward. A survey results in data being collected regarding a large population by using a sample of that population (Leedy & Ormrod, 2004). According to Leedy and Ormrod (2004:179) “descriptive research examines a situation as it is”. A descriptive research design enables the researcher to describe the conditions and relationships that exist within the specific situation, as well as the processes that are present and the effects thereof (Cohen, Manion & Marrison, 2002). A specific situation is therefore investigated in order to develop insight into the nature of the situation and to identify possible problems (Leedy & Ormrod, 2004). This implies that the communication development of high-risk neonates

in a KMC programme was investigated in order to gain insight into their development and identify possible developmental problems.

Furthermore, a comprehensive overview of a representative sample of a large population was obtained through the use of a survey design (Mouton, 2001). The survey design allows the researcher to describe the uniqueness, complexity and dynamics which exist in a specific situation (Cohen et al., 2002). Observation was used as a method to focus on a specific aspect of neonatal development and/or behaviour (Leedy & Ormrod, 2004). Observations allow the researcher to quantify the behaviour by recording the frequency of behaviour and the intensity of a specific behaviour (Leedy & Ormrod, 2004). This led to quantitative data which was processed and analysed by means of descriptive and inferential statistics (Cohen et al., 2002; Mouton, 2001).

As neonatal development was described in the specific context of a KMC programme and the results were analysed as a group, “the whole is more important than the sum of its parts” (Cohen et al., 2002: 181). The observation of ongoing developmental processes in a natural setting, such as the KMC ward of a hospital, leads to a holistic view of specific events (Neuman, 2000). Although a KMC ward is not a natural setting for neonatal development, the research context was natural since no variables in the environment were manipulated. As the researcher did not deliberately control or manipulate conditions in the KMC ward the research was not experimental (Cohen et al., 2002). The data was obtained by successive observational measurements taken at different points in time from the same respondents, thus resulting in a prospective longitudinal cohort study (Cohen et al., 2002). A longitudinal study is useful to chart growth and development over time that could lead to recommendations for intervention (Cohen et al., 2002). A prospective longitudinal cohort study also enabled the researcher to describe a wide range of variables, identify change in neonatal development over time and compare individual participants’ development over time (Cohen et al., 2002).

Quantitative data as part of the descriptive survey results in the identification of characteristics of a specific phenomenon (Leedy & Ormrod, 2004). The quantitative data

led to an in-depth description of neonates' communication development in the specific context of a KMC programme over time, in order to determine change and identify possible intervention strategies for the changing developmental needs.

Consecutive observations and the completion of the Data-collection Protocol for High-risk Neonates with every observation of every neonate enabled the researcher to describe neonatal communication development as it took place within the framework of various developmental subsystems in the context of a KMC programme.

### **3.4 ETHICAL CONSIDERATIONS**

When *people* are the focus of research, ethical implications are very important (Leedy & Ormrod, 2004). Even if the researcher has the right to search for truth it may not be done at the expense of other individuals' rights (Mouton, 2001). Therefore, the research proposal was submitted to the Faculty of Humanities' Research Proposal and Ethics Committee (See Appendix E) and the Faculty of Health Sciences' Research Ethics Committee (See Appendix F) and approval to conduct the research was granted.

The ethical considerations for this research project can be described according to three ethical principles:

#### **3.4.1 RESPECT FOR PERSONS**

As people have a right to freedom and self-determination it is necessary to obtain informed consent from them when they participate in a research project (Cohen et al., 2002). To ensure that the participants' rights receive appropriate consideration, a few aspects need to be taken into account. The neonate's mother must be competent to make a correct decision when she has been given the relevant information. She must understand the nature of the research project and freely choose whether to participate or not in the research (Cohen et al., 2002; Strydom, 2002).



Informed consent for both the pilot study and main study was obtained through written consent and in the cases where written consent was not possible, verbal consent was obtained (See Appendix A). In the cases where the participant's mother did not understand English or Afrikaans, an interpreter's assistance was used to explain the relevant information. Consent was obtained by providing a written and verbal explanation to the hospital (See Appendix B) and the participant's mother about the purpose of the study, the procedures that were used, possible benefits and risks related to the study and the participant's rights (See Appendix C) (Cohen et al., 2002; Leedy & Ormrod, 2004; Strydom, 2002). Both the informed consent form and participant information leaflet were translated into Sotho, by professional translators, to ensure that the participants' mothers understood the relevant information. To ensure an informed decision by the mothers, they had to be aware of the facts regarding the study and they had to have the same interpretation of the facts as the researcher (Harrison, 1997). Furthermore, the participant's mother had the right to withdraw from the study at any given time during the research project (Mouton, 2001; Strydom, 2002).

In any research project the participant's right to privacy must be respected (Leedy & Ormrod, 2004). This can be expressed as the participant's mother's right to refuse that her infant may be observed or to refuse to answer specific questions (Mouton, 2001). The participant's and mother's right to privacy were ensured through applying the principles of confidentiality and anonymity. Anonymity refers to the participant's and mother's identity, whereas confidentiality refers to the data collected (Mouton, 2001). Subject numbers and data-collection numbers were used to achieve this. Publication of findings will be done without any identifying reference to participants or their mothers.

A research report was compiled to make all the results of the study known and the findings of the study will be published in the form of an article. To ensure a clear understanding of the research findings, the researcher endeavoured to report the findings of the study as accurately and objectively as possible by using clear and unambiguous language (Strydom, 2002). Findings were also reported by including the shortcomings of

the research project and stating further research possibilities. All resources consulted and the people who contributed to the study were recognized (Strydom, 2002).

### **3.4.2 BENEFICENCE AND NON-MALEFICENCE**

The purpose of beneficence is to work in the participant's best interest and to promote good, whereas non-maleficence protects the participant from harm (Barndt-Maglio, 1999). Therefore the participant of a research project must not be exposed to substantial risk (Mouton, 2001). This is especially important for this research project as the participants were neonates who could not make decisions for themselves and some of the mothers may have had low literacy levels, low social status and may have been unfamiliar with social research (Mouton, 2001). These characteristics depict them as a vulnerable group, making it necessary for the researcher to continuously take their rights into consideration (Mouton, 2001).

Beneficence can be facilitated by applying the ethic of care which involves willingness to work in the best interest of a person with whom a relationship is established (Barndt-Maglio, 1999). The ethic of caring implies emotions such as empathy, compassion and concern that set the stage for respect of the participant's and mother's dignity, quality of life and overall well-being (Barndt-Maglio, 1999). Non-maleficence was ensured through the researcher not interfering with care-giving routines and strictly following measures for infection control. The mothers of the participants received a copy of the signed consent form and they had the right to withdraw from the study at any given time.

The researcher should further ensure beneficence by continuously judging her conduct on the basis of ethical guidelines by being aware of her ethical responsibility throughout the course of the research project (Strydom, 2002). It is also researchers' responsibility to ensure that they are competent and adequately skilled to undertake a research project (Strydom, 2002). In this research project the researcher was familiar with most of the instruments and checklists used in the data-collection protocol as they were used in a previous research project (McInroy & Kritzinger, 2005). A pilot study was also conducted to ensure the researcher's competence in the use of the data-collection

protocol. The researcher's responsibility to be competent and adequately skilled was emphasized as the research was conducted across cultural boundaries (Strydom, 2002).

Although the research held no benefit for the individual participants and their mothers, the knowledge gained from the research project may benefit high-risk neonates in the future. Participating in this research project was in no way harmful to the participants and their mothers. Considering the social benefits of the research against the personal costs of the individual is called the costs/benefit ratio (Cohen et al., 2002). It is clear that a favourable risk-benefit balance existed when participating in this research project.

### **3.4.3 DISTRIBUTIVE JUSTICE**

Applying justice to a research project means treating all participants in the same manner and to be fair in any form of judgment (Barndt-Maglio, 1999). A competent researcher should refrain from making value judgments by being sensitive to the values and norms of the community before commencing with the research project (Strydom, 2002). Even when the views and/or actions of the participants' mothers are conflicting to those of the researcher, value judgments should not be made (Strydom, 2002). In this research project the researcher had a better understanding of the mothers' values, norms, views and actions as the researcher had experienced working with mothers in the KMC ward.

In order to facilitate cooperation between the participant's mother and the researcher, the researcher must have respect for the community's customs (Strydom, 2002). The researcher must also be aware of the possibility of inequality between her and the participant's mother. This was especially true as some of the mothers had low literacy levels. It was thus important to ensure a complete understanding of the participant information brochure and allow sufficient time for the participant's mother to ask questions so to facilitate informed consent. To ensure effective cooperation it was important for the researcher to continuously monitor the differences between her and the participant's mother (Burgess, 2000). Gaining informed consent from the hospital (See Appendix B) to do the study, as well as informed consent from the mothers was important as it facilitated cooperation between the researcher and participants in the

research project. This is especially important for a longitudinal study that will continue over a period of time (Cohen et al., 2002).

Sampling selection criteria were also clearly defined so that there was a sound understanding of who was included and who was excluded from the study. Mothers and neonates who did not qualify for the study were not approached. Fair distribution of benefits will be facilitated by publicizing the results of the research project in an article so that the results are made public to the scientific community (Strydom, 2002).

### **3.5 SAMPLE**

A non-probability purposive sample strategy was used to select participants. According to this sample strategy, some neonates in the KMC ward were definitely excluded and others included in the sample. This selection method was appropriate, as the researcher purposely selected a specific section of all the neonates present in the KMC ward to include in the sample (Cohen et al., 2002). Purposive sampling led to participants who were chosen to meet the researcher's needs for data collection as they were selected for a specific purpose (Cohen et al., 2002). The participants were selected according to certain selection criteria.

#### **3.5.1 SELECTION CRITERIA**

- **Hospitalization**

The participants and their mothers had to be patients of the same hospital for the duration of the observational period. The patients must have been admitted to the NICU and then transferred to the KMC unit where data collection took place.

- **High-risk status**

The participants had to be in the very low birth weight (<1 500g) category as approximately 50% of the infants admitted to the KMC unit are in this category (Van Rooyen et al., 2002). The risk for developmental delays or disorders also increases for the

very low and extremely low birth weight population (ASHA, 2004). These infants are usually admitted to a hospital for a considerable amount of time (Moehn & Rossetti, 1996) that allows enough change to be observed over time (Leedy & Ormrod, 2004). Although the participants were part of a high-risk population no congenital disorders, which could interfere with development, should have been present.

▪ **Informed consent**

The caregivers had to be willing to participate in the research project. Informed consent from the caregivers was important, as voluntary participation is an ethical principle of research (Strydom, 2002).

▪ **Minimum data-collection sessions for each participant**

The neonates approximately spend two weeks in the KMC unit (Van Rooyen et al., 2002). In order to track the participants' development over time, they had to be observed for a minimum of three sessions during their stay in the KMC unit. The maximum number of data-collections was restricted to four sessions.

### 3.5.2 SELECTION PROCEDURES

Certain selection procedures were followed to select the appropriate hospital and to identify high-risk neonates for the study.

▪ **Hospitals implementing KMC**

For practical reasons the hospital had to be located in Pretoria. Another important consideration was whether the hospital implemented KMC as part of their care of high-risk neonates. Kalafong Hospital was selected as they implement KMC and it is presently the only unit in Pretoria. The KMC unit has also been operating successfully for the past four years (Van Rooyen et al., 2002).

▪ **High-risk status**

All high-risk neonates that met the selection criteria were selected as potential participants. Consultation with staff in the NICU and/or KMC unit aided the selection of

appropriate subjects. Selection took place according to the non-probability purposive sample strategy.

### 3.5.3 SAMPLE SIZE

When estimating the sample size for a specific research project various factors need to be considered namely sampling error, sample reliability, population variance and available resources (Alreck & Settle, 1995; Leedy & Ormrod, 2004; Strydom & Venter, 2002).

By using the KMC unit's statistics, in cooperation with a statistician, it was determined that the number of neonates admitted to the ward from the period 2001/2002 to 2002/2003 increased by approximately 16%. By using the growth factor the number of neonates estimated to be admitted to the ward in the 2003/2004 period was approximately 497 neonates. One of the selection criteria was that the neonates' birth weight had to be below 1 500g. Approximately 49% of the neonates admitted to the ward fulfil this selection criterion. The number of neonates admitted to the ward with a birth weight less than 1 500g was estimated to be 210 per year.

When the sample size is known and no specific factors have to be taken into account in determining the sample the following formula may be considered (Coetsee, 2004).

$$n = \sqrt{20N}$$

*n* - Sample size

*N* - Population size

$$\text{Therefore } n = \sqrt{20(210)} = 64.8 \approx 65$$

The sample size was therefore determined as 65 participants.

After completion of the pilot study it was however, evident that the estimated time frame for the data collection of 65 participants would not be viable for the period in which the study needed to be completed. As there were specific criteria for the selection of appropriate participants for the study, the homogeneity of the sample utilized for the research project was increased.

Although sample error decreases with an increase in sample size, sample error also decreases with a decrease in population variance (Alreck & Settle, 1995; Leedy & Ormrod, 2004). Sample error needs to be as low as possible to ensure sample reliability (Alreck & Settle, 1995; Leedy & Ormrod, 2004; Strydom & Venter, 2002). According to Strydom and Venter (2002) a ten percent sample should control sampling error. Ten percent of the estimated 210 neonates per year results in 21 participants.

Indications for a smaller sample size were therefore the increased homogeneity of the population, the fact that the analysis and interpretation of results was based on the entire sample and the time constraints of the research project (Alreck & Settle, 1995). Accordingly, the sample size was determined as 25 participants.

#### **3.5.4 DESCRIPTION OF SAMPLE**

The sample consisted of 25 participants who were described according to the most important characteristics of the participants' mothers and characteristics pertaining to the participants themselves. Four observations each were completed for 20 of the participants and three observations each for five participants. A description of the sample is included in Table 1.

The different characteristics of both the mothers and participants are described by means of average values, the range of the values and percentages of the characteristics present. The different characteristics are also discussed according to their potential as a risk or protective factor for neonatal development.

**Table 1. Description of the participants and their mothers**

<b>Characteristic</b>	<b>Description</b>	<b>Discussion</b>
<b>Age of mother</b>	Average: 30 years Range: 18 - 42 years	According to Rossetti (2001) the optimal maternal age range for black woman is 25 - 29 years. 11 mothers were between 18 and 25 years of age and four mothers were above 35 years, placing them at risk for infant mortality.
<b>Maternal education</b>	Average: Standard 6 Range: Standard 2 - Tertiary Education	44% of the mothers did not complete matric while 32% did complete matric and only six mothers (24%) had some form of tertiary education. According to Rossetti (2001) infant mortality decreases with an increase in maternal education.
<b>Reason for premature birth:</b>		According to Deering and Satin (2002) a third of pre-term deliveries are associated with maternal hypertension and placental hemorrhage. In this study 48% of the participants' mothers gave pre-term birth due to hypertension and in 8% of the mothers hypertension was a contributing factor. Therefore, in 56% of the mothers hypertension was a risk factor for pre-term delivery, which correlates with Pattinson's (2002) research which indicates that complications of hypertension in pregnancy is one of the main causes of perinatal deaths in South Africa.
Hypertension / Pre-eclampsia	48%	
Hypertension & Diabetics	8%	
Hypertension & HIV/AIDS	8%	
Premature membrane rupture	12%	
Cervical incompetence	4%	
Twin delivery: 1st twin died in utero	4%	
HIV and AIDS related	4%	
Mother not aware of pregnancy	4%	
Reasons unknown	8%	
<b>Duration of pregnancy</b>	Average: 31 weeks Range: 26- 36 weeks	Birth weight and gestational age are both related to infant mortality. Therefore these two factors are also associated with a risk for later developmental delays. As all the participants were born before 37 weeks gestation and weighed less than 1 500g they could all be classified as premature and low birth weight (Southgate & Pittard, 2001). This implies that all the participants are at risk for developmental delays (Rossetti, 2001).
<b>Birth weight</b>	Average: 1125 g Range: 770 - 1480 g	
<b>Small-for-gestational age</b>	40% of the participants	40% of the participants displayed a sub-standard growth rate for their gestational age which is termed intrauterine growth restriction (IUGR). According to Southgate and Pittard (2001) black woman demonstrate a higher rate of low birth weight and IUGR infants. IUGR is a risk for asphyxia and is also associated with a higher mortality rate and poor neuro-development.
<b>Apgar score at 5 minutes</b>	Average: 5 Range: 0 - 10	An average Apgar score of 5 indicates moderate neonatal asphyxia, which indicates impaired oxygen delivery to the neonate's body. Severe asphyxia is a risk for various medical conditions which could lead to developmental delays (Askin, 1996; Rossetti, 2001; Ward & McCune, 2002). Intrapartum asphyxia is also one of the primary causes of death in premature neonates in South Africa (Pattinson, 2002).



According to Table 1 the profile of the participants' mothers revealed that they were an average age of 30 years old and had a standard six educational level. The average length of their pregnancies was 31 weeks mainly due to hypertension and pre-eclampsia. A total of 92% of the infants were in the very low birth weight category and 40% of the participants were small-for-gestational age. A risk for developmental delays and specifically communication disorders or delays is present due to the participants' prematurity and low birth weight. The maternal education level and the presence of IUGR increases the risk for developmental delays (Rossetti, 2001; Southgate & Pittard, 2001).

### **3.6 MATERIAL AND APPARATUS**

A structured data-collection method was selected as observation was the primary method of data collection. This data-collection method included the use of a structured data-collection instrument during observation in a natural environment (Bailey, 1994). The observations were guided through the use of a data-collection protocol that was designed specifically for the purpose of this research project.

Material for the study included the Data-collection Protocol for High-Risk Neonates (See Appendix D). The data-collection instruments used to compile the Data-collection Protocol for High-risk Neonates are included in Table 2.

Apparatus for the study included the following:

- A red ring.
- A high frequency rattle.

Both these apparatus were used to elicit behaviour once the participant was ready for interaction.

**Table 2. Evaluation material used for data collection**

<b>Evaluation area</b>	<b>Aim and justification for use</b>	<b>Components selected from assessment instruments to compile the data-collection protocol</b>	<b>Reference</b>
Development of feeding behaviour	To describe the high-risk participant's feeding behaviour from admission to discharge from the KMC ward.  Feeding problems associated with NICU stay are considered a risk for communication disorders (Rossetti, 2001).	Clinical Evaluation of Pediatric Dysphagia * General postural control * Nutritive sucking * Non-nutritive sucking	Hall, 2001
		Feeding Evaluation Form For At-Risk Infants (FERFARI) * Stages of alertness during feeding * Stress cues during feeding	Uys, 2000
		The Newborn Child * Cup feeding	Johnston, 1998
		Clinical Feeding Evaluation of Infant * Feeding method	Kritzinger, 1996
		LATCH: A Breastfeeding Charting System and Documentation Tool * Latching * Positioning	Jensen, Wallace & Kelsay, 1994
		Oral-Motor/Feeding Rating Scale * Oral-motor / Feeding patterns	Jelm, 1990
The participant's states, state transitions and the ability to establish organized behaviour	To describe the high-risk participant's states and state transitions and ability to establish organized behaviour.  The observed behaviour of an infant can be used to determine the fetal brain's need for stimulation. Developmentally appropriate intervention that aims to support the infant can also be determined accordingly (Als, 1999).	Developmental Assessment * Sleep-awake states * Motor organization or disorganization * States well-organized or disorganization * Attention / Interaction subsystem or disorganization * Self-regulation or disorganization	Willemse, 2003
Environment of the KMC ward	To describe the KMC ward in terms of lighting, noise levels, positioning and support of the neonate.  Research indicates that an unfavourable environment can over-stimulate the neonate's central nervous system (Als, 1999). The KMC context provides an ideal environment for neonatal development (Feldman, 2004).	Neonatal Communication Assessment Guide * Description of the environment	Swanepoel, 2000

Table 2 Continued

Evaluation area	Aim and justification for use	Components selected from assessment instruments to compile the data-collection protocol	Reference
Neonatal communication skills	<p>To describe the participant's communication development from admission to discharge from the KMC ward.</p> <p>The description of the neonate's communication skills was central to this study as this population has an increased risk for communication developmental delays, and communication development is dependent on and interrelated to other developmental areas (Billeaud, 2003; McInroy &amp; Krtzinger, 2005; Rossetti, 2001).</p>	<p>Neonatal Communication Assessment Instrument</p> <ul style="list-style-type: none"> <li>* Precursors of language use</li> <li>* Precursors of language content</li> <li>* Precursors of language form</li> <li>* Precursors of cognition</li> </ul>	Kritzinger, 2003
Mother-neonate interaction	<p>To describe the mother-neonate interaction from admission to discharge from the KMC ward</p> <p>KMC promotes mother-neonate attachment which in turn facilitates mother-neonate interaction which forms the basis of communication development (Feldman, 2004; Billeaud, 2003).</p>	Observation of Communication Interaction	Klein & Briggs, 1986
The mother's application and understanding of KMC	To describe the mother's application and understanding of KMC.	KMC daily scoring sheet	Van Rooyen, 1999
Biological risk factors	<p>To describe the characteristics of the participants and their mothers.</p> <p>Anything that interferes with the child's ability to interact with the environment in a normal manner can be a potential cause of a developmental delay (Rossetti, 2001). Risk factors also provide an example of the information a speech-language therapist needs to be familiar with to provide a parent-training programme and developmentally appropriate intervention guidelines to high-risk neonates (McInroy &amp; Kritzinger, 2005).</p>	Risk Assessment	Kritzinger, 2003
		The participants' medical files	

## 3.7 PROCEDURES

### 3.7.1 PILOT STUDY

#### ▪ Aims

The pilot study was conducted with the aim to:

- Determine whether the methodology, sampling, instruments and analysis that was used for the study was appropriate (Strydom, 2002).
- Ensure that the protocol and procedures used to collect data was suitable, effective, reliable, valid and free from problems and errors (Strydom, 2002).
- Provide the opportunity to modify the data-collection protocol which, in turn, would increase the reliability thereof and contribute to the success and effectiveness of the research (Neuman, 2000).
- Enable the researcher to determine how long each observation session would be and how many participants could be assessed in a two week period. This information would be used to determine whether data collection of 65 participants was possible and to realistically plan the time frame for data collection.
- Increase the researcher's familiarity and competence in completing the Data-collection Protocol for High-Risk Neonates.
- Determine if the data-collection protocol measured neonatal development in sufficient detail to indicate change over time.

#### ▪ Description of sample

The sample consisted of three participants who are described in Table 3. Every participant was observed four consecutive times resulting in 12 completed data-collection protocols. As a description of all the characteristics relevant to the participants and their mothers provided too much detail some variables (e.g. birth order of the infant) were omitted. Variables relating to the participants' perinatal history were grouped together to keep the focus on the participants' characteristics in the KMC unit.

**Table 3. Description of the three participants and their mothers utilized for the pilot study**

<b>Characteristic</b>	<b>Description</b>	<b>Discussion</b>
<b>Age of mother</b>	Average: 25 years Range: 21-32 years	The average age of the mothers were within the optimal age range (25-29 years) for black mothers to prevent infant mortality (Rossetti, 2001).
<b>Maternal education</b>	Secondary education (senior certificate): 2 Tertiary education: 1	The higher level of maternal education could have been protective factor for successful adaptation of the high-risk neonates and against neonatal death (Rossetti, 2001; Werner, 2000).
<b>Duration of pregnancy</b>	Average: 29 weeks Range: 28-30 weeks	Gestational age indicated extreme prematurity which is a risk factor for developmental delays including a communication delay or disorder (Rossetti, 2001; Southgate & Pittard, 2001).
<b>Age of participants at first data collection</b>	Average: 48 days Range: 36-59 days	
<b>Birth weight</b>	Average: 963g Range: 900-1 030g	<i>Ideal: 3 200-3 800g.</i> Birth weight indicated that the participants were mainly within the extremely low birth weight category and one participant was small for gestational age. Both these characteristics are risk factors for developmental delays including a communication delay or disorder and sensorineural hearing loss (Bess, 1993; Rais-Bahrami et al., 2002; Rossetti, 2001).
<b>Apgar score at 5 minutes</b>	Average: 7.5 Range: 7-8	<i>Ideal: 7-10:</i> As the Apgar score is an indicator of neonatal asphyxia the participants did not display asphyxia (Rossetti, 2001).
<b>Medical conditions:</b> Respiratory distress syndrome: Oxygen received in NICU	2 participants Average: 20 days Range: 5-43 days	The different medical conditions are risk factors for prolonged NICU stay as well as risk factors for sensorineural hearing loss, feeding problems and a communication delay or disorder (Arvedson & Brodsky, 2002; Roizen, 2003; Rossetti, 2001).
Septicaemia: Amino glycoside therapy received in NICU	All participants	
Duration photo therapy in NICU	Average: 3 days Range: 2-4 days	
Blood transfusion Neonatal convulsions	2 participants 1 participant	
<b>Number of days in NICU and/or High Care</b>	Average: 41 days Range: 34-48 days	<i>Ideal: None.</i> Potential risk factor for developmental delays including a communication delay or disorder (Rossetti, 2001).
<b>Number of days before bottle/breast fed</b>	Average: 45 days Range: 42-50 days	<i>Ideal: None.</i> Potential risk factor for a communication disorder due to a suck and/or swallow disorder (Arvedson & Brodsky, 2002; Rossetti, 2001).

The data-collection instrument permitted a detailed description of the participants' characteristics and of their mothers. These characteristics could be used to determine correlations with the participants' functioning in various developmental areas and progress over time.

▪ **Material and apparatus**

The material and apparatus used for the pilot study was the same Data Collection Protocol for High-Risk Neonates that was planned for the main study (See Appendix D).

▪ **Procedures**

Observation was the main method used for collecting data. A structured data-collection instrument was used to guide the numerous semistructured observations. Semistructured observation allows the researcher to review the observed data which leads to the explanation of a specific situation, namely the communication development of high-risk neonates in the context of a KMC programme (Cohen et al., 2002). The data-collection protocol compiled from various assessment instruments is mainly in the form of check-lists.

Information was also gathered by consulting the participant's medical file and indicating relevant information on the data-collection protocol. Interpretation of documentation and reports allows the collection of data that would otherwise not be possible (De Vos & Fouche, 1998).

The procedures for the conduction of the pilot study can be described as follows:

- Obtaining permission from the relevant hospital authorities to conduct the study.
  - A written and verbal explanation was provided to the hospital regarding the purpose of the study, procedures used to conduct the study, possible benefits and risks related to the study (See Appendix B).
- Selection of suitable participants to be used for the study.
  - According to selection criteria stated in 3.5.1.
- Obtaining informed consent from the selected participants' mothers.

- A verbal explanation regarding the purpose of the study, procedures used to conduct the study, possible benefits and risks related to the study was provided to possible participants' mothers.
- Thereafter a participant information leaflet was given to the mothers containing the information given during the verbal explanation. The participant information leaflet was provided in English or Sotho depending on the mother's preference.
- The mothers were given the opportunity to ask the researcher questions as to clarify anything they did not understand.
- Lastly, the mothers were asked to provide written consent to confirm their willingness in the participation of the study.
- Observation of participants and completion of the data-collection protocol from admission to discharge from the KMC ward.
  - The first data collection for a participant took place within the first three days after admission to the KMC ward. Thereafter data was collected approximately twice weekly for a specific participant until discharge from the KMC ward as to facilitate a minimum of three or a maximum of four consecutive observations.
- The researcher was responsible for all observations made of the participants in the KMC ward.
- The participants were observed for 30 to 60 minutes in the mornings, during feeding times and before feeding times while the mothers were applying KMC.
- The researcher did not interfere with the participants' care-giving routines and the mothers were not expected to do anything other than care-giving.

#### ▪ **Results**

During completion of the pilot study it was determined that the most suitable time for data collection was the mornings during the first and second feeding sessions of the day as most of the mothers were awake during this time, thus enabling the observation of mother-infant interaction. This time also suited the nursing staff of the ward. It was also established that neonatal behaviour had to be observed before a feeding session as most

of the participants fell asleep during feeding times resulting in little neonatal behaviour being able to be observed after feeding sessions.

Although the KMC ward has scheduled feeding times the mothers regularly follow a demand feeding routine resulting in lengthy observation sessions as feeding times did not always correlate with the ward's scheduled feeding times. These unscheduled feeding times necessitated a time period of between 45 to 90 minutes during which the observation was completed. Due to the uncertainty regarding the length of an observation and observations often extending beyond an hour it was possible to only observe two participants per morning.

Due to consecutive observations of every participant it was possible to complete six participants' observations within a two week period resulting in an estimated time frame of 22 weeks for completion of the study with 65 participants. Considering the selection criteria as stated in 3.5.1, it is evident that the number of neonates who fulfil the selection criteria in the ward may fluctuate over time, possibly extending the data-collection period. Therefore, the pilot study enabled the planning of a realistic time frame for the completion of the study and consequently supported a decision regarding the number of participants used for the main study.

The results also indicated that certain sections of the data-collection protocol were too detailed. Although the main categories of the protocol remained the same some variables were removed, making the protocol more specific for the purpose it was designed for.

During conversations with the participants' mothers to obtain consent for the pilot study, it became clear that the researcher had to be sensitive for the mothers' cues regarding their comprehension of the information given. Therefore, certain strategies were adopted:

- The information was presented at a slower pace giving many opportunities for the mothers to ask for clarification.
- The researcher became familiar with ways of presenting the information in a more



- unambiguous way resulting in a less stressful situation for both the researcher and the mother.
- Reflection (to check for understanding) was also developed as a strategy to confirm the mothers' comprehension of the message.

After completion of the 12 protocols the researcher's confidence and competence in the observation of the participants increased due to familiarity with the Data-collection Protocol for High-Risk Neonates and the situation itself. The development of the participants' communication skills was determined to provide an indication of whether the Data-collection Protocol for High-Risk Neonates was detailed enough to measure change over time. The communication development was determined by calculating the percentage of behaviour that was present for every precursor of communication development during a specific data-collection session. The pilot study participants' communication development over time is presented in Table 4.

**Table 4. Communication development of participants over time**

	<b>Participant 1</b>	<b>Participant 2</b>	<b>Participant 3</b>
<b>Precursors of Language Use</b>			
<b>Session 1</b>	29%	0%	29%
<b>Session 2</b>	29%	28%	29%
<b>Session 3</b>	29%	57%	57%
<b>Session 4</b>	43%	57%	57%
<b>Precursors of Language Content</b>			
<b>Session 1</b>	20%	0%	20%
<b>Session 2</b>	20%	40%	40%
<b>Session 3</b>	20%	40%	80%
<b>Session 4</b>	40%	80%	80%
<b>Precursors of Language Form</b>			
<b>Session 1</b>	33%	22%	44%
<b>Session 2</b>	33%	33%	44%
<b>Session 3</b>	33%	33%	33%
<b>Session 4</b>	33%	22%	33%
<b>Precursors of Cognition</b>			
<b>Session 1</b>	0%	0%	0%
<b>Session 2</b>	0%	0%	14%
<b>Session 3</b>	0%	14%	14%
<b>Session 4</b>	0%	14%	0%

(Gray areas indicate a change in communication development over time)

According to Table 4 all the participants' communication development changed over time as more behaviours regarding precursors of communication development were displayed. Although precursors of language form seemed to decrease over time all three the other communication developmental areas increased over time, indicating a change in communication development for every neonate. Precursors of language form are measured by the sounds the neonates make and their crying. A possible reason for a decreases in the precursors of language form may be the fact that neonates do not cry often while receiving KMC (Ludington-Hoe & Swinth, 1996). It can therefore be expected that the Data-collection Protocol for High-Risk Neonates is detailed enough to determine change over time.

The pilot study contributed to the main study by:

- Determining the time frame of every data-collection session.
- Estimating a time frame for the entire data-collection process.
- Determining the best time of day to observe the participants.
- Reducing the sample size.
- Refining the data-collection protocol.
- Confirming that the Data-collection Protocol for High-Risk Neonates measures change over time.
- Facilitating effective strategies of communicating with the participants' mothers.
- Ensuring familiarity with the data-collection protocol and the routines in the KMC ward.
- Providing a method to present the participants' characteristics.

### **3.7.2 RELIABILITY AND VALIDITY**

#### **▪ Reliability**

According to Cohen et al. (2002), reliability is concerned with precision and accuracy which implies that should this research project be repeated, similar results should be found. Reliability is not concerned with what is being measured, but rather with how well it is being measured (Delpont, 2002). The reliability of the research results therefore

is dependent on the reliability of the data-collection instrument and the researcher's observations (Neuman, 2000).

To increase the reliability of the Data-collection Protocol for High-Risk Neonates that was used for this study the following was done:

- The data-collection protocol is divided into eight sections to facilitate separate observation and recording of different aspects. Reliability increases when a single concept is recorded and specified (Neuman, 2000).
- A pilot study is conducted to enable modification of the data-collection protocol (Neuman, 2000).
- The subjects are observed regularly and enough time is set aside for data collection to control observed changes due to a specific variable.

The researcher increased the reliability of the individual observation sessions by using a new data-collection protocol for every session to reduce any possible bias which could be created by referring to previous data collections.

#### ▪ **Validity**

The concept of validity can be divided into two parts, namely 1) does the instrument measure that which it is supposed to measure? and 2) is the specific concept being measured accurately (Delpont, 2002)? Without validity the measurements have no meaning as validity is a dynamic process that develops in correlation with data collection over time (Neuman, 2000).

The following types of validity are applicable to this study:

##### i. Internal validity

Internal validity refers to the researcher's ability to deduct accurate conclusions from the data according to the design of the research and the data that is obtained. The researcher therefore needs to ensure that the conclusions made are deducted from the data collected (Leedy & Ormrod, 2004). In other words, the explanation of a specific concept must be sustained by the data (Cohen et al., 2002).

ii. Face validity

Face validity refers to the appearance of the instrument that is used for data collection and whether the appearance of the data-collection instrument appears to be relevant for the attributes it is supposed to measure (Delpont, 2002). Face validity of the data-collection protocol has been confirmed by previous research which used a similar data-collection protocol (McInroy & Kritzinger, 2005).

iii. Content validity

Content validity can be described as the adequacy of the instrument to measure the concept it purports to measure and whether the instrument provides an adequate sample of items to represent the specific concept (Cohen et al., 2002; Delpont, 2002). To ensure and increase the content validity of the data-collection protocol for this study, a pilot study was conducted to facilitate the necessary modifications to the instrument.

### **3.7.3 DATA COLLECTION PROCEDURES**

As the data-collection procedures were effective for the successful completion of the pilot study it mainly remained unchanged for the main study.

The procedures were slightly adapted by:

- Increasing the duration of the data-collection sessions from 30 to 60 minutes to 45 to 90 minutes for each participant.
- Changing the time of the observations sessions: data collection to be carried out before the participants' feeding times.

### **3.7.4 DATA RECORDING PROCEDURES**

Data was recorded twice weekly for each participant from admission until discharge from the KMC ward in order to record the developmental changes over time. Recording of data was guided through the use of the Data-collection Protocol for High-Risk Neonates that was completed for every observation session. Data was recorded during the observation session and the researcher checked for accuracy of data collection immediately after the data-collection session as not to forget any relevant information.

### **3.7.5 DATA ANALYSIS PROCEDURES**

Firstly the accuracy of data recorded electronically was confirmed by determining that the data on the computer spread sheets were the same as the data on the data-collection protocols. Data was analysed according to a quantitative approach. The numerical values were obtained by the measuring and/or counting of data (De Vos, Fouche & Venter, 2002). Measuring whether a certain variable was present or not, in what order it was present and counting how often it was present during every observation. Univariate analysis was used to analyse every variable individually. The data for every variable or category was summarized in the form of tables and/or graphs (De Vos et al., 2002).

Nominal data was used to identify the categories according to which every participant could be classified (Cohen et al., 2002). Frequency distribution was used to describe how often a certain characteristic of neonatal development was present during an observation and throughout the study (Cohen et al., 2002).

Data was therefore presented in the following ways (De Vos et al., 2002; De Vos, 2002):

- By describing the presence or absence of participant behaviour or characteristic.
- By describing the presence of a behaviour or characteristic according to the intensity in which it is present by determining the percentage of behaviour present.
- By describing the behaviour or characteristic according to the number of times it was present over a specific period of time, i.e. the frequency of the data.
- By describing the length of time for which a specific phenomenon was present.

### **3.8 SUMMARY**

Chapter three provides a framework for the planning and execution of the empirical study. The aim of the research project is to describe the communication development of high-risk neonates as it takes place in the context of a KMC ward by referring to various areas of neonatal development.

This empirical study in the form of a longitudinal descriptive survey therefore allows the researcher to observe the neonates' developmental changes over time. Ethical implications applying to this specific study were explained. Participants utilized in the study were described in terms of selection criteria and procedures and specific characteristics pertaining to the participants' mothers and themselves. The material and apparatus used for the study were also described. The pilot study and results were discussed in detail in order to increase the validity of the protocol and reliability of the data-collection procedures.

## CHAPTER 4

### RESULTS AND DISCUSSION

*Aim:* To present, describe and interpret collected and processed data. The results are represented and described by means of graphic presentations and tables. The research aim specified in chapter three was used to categorize and interpret the results according to initial orientations discussed in chapter one and two.

#### 4.1 INTRODUCTION

Due to the interacting biological and environmental risk factors of prematurity, low birth weight, poverty and HIV and AIDS in the South African context (Kritzinger, 2004) KMC has been established as best practice for the caring of newborn infants, but especially of high-risk neonates (Power, 2002). A dearth of research regarding characteristics of feeding and communication development of infants in a KMC programme and the role of the speech-language therapist in such a programme led to the main aim of the study. The main aim was to observe and describe the early communication development of a group of high-risk neonates from admission to discharge from a KMC unit.

This aim was realized by observing premature and/or low birth weight neonates and their mothers in the context of a KMC programme and completing the Data-collection Protocol for High-Risk Neonates (See Appendix D) for three to four observations for each of the 25 participants.

## **4.2 DESCRIPTION OF DIFFERENT CHARACTERISTICS OF NEONATAL DEVELOPMENT FROM THE TIME OF ADMISSION TO DISCHARGE FROM THE KMC UNIT**

### **4.2.1 HISTORY OF PERINATAL CONDITIONS AND MEDICAL CARE OF THE PARTICIPANTS**

The data regarding the perinatal conditions of the participants were obtained by studying the participants' medical files in the KMC unit and completing Section 6 of the Data-collection Protocol. The conditions are described by means of average values, the range of the values and percentages. The perinatal conditions and medical care of the participants are described by referring back to the description of the participants and their mothers in Table 1 (see Chapter 3). Table 1 referred to the characteristics of the participants and mothers which could possibly have been risk factors for premature delivery whereas Table 5 represents the medical conditions and care of the participants.

*The age of the participants at the time of data collection was between eight and 42 days. They were observed over an average period of 11 days, with data-collection periods ranging from eight to 12 days. Within the period of 11 days 20 of the participants were observed four times while 5 of the participants were observed three times. The data-collection periods were based on a study which found that the neonates spend an average period of 13 days in the KMC unit at Kalafong Hospital (Van Rooyen et al., 2002).*

Table 5 represents the history of the participants' medical conditions before data collection as none of these conditions occurred while the participants were in the KMC unit and only 5% of the participants received oxygen in the KMC unit.



**Table 5. History of perinatal conditions and medical care of the participants in the NICU and high care (n=25)**

Condition	Description
5.1 Respiratory distress syndrome	12 participants: 48%
5.2 Oxygen received and duration	22 participants: 88% Average: 26 days Range: 1 - 51 days In KMC unit: 5 participants: 20%
5.3 Septicemia	10 participants: 40 %
5.4 Aminoglycoside therapy duration	Average: 5 days Range: 1 - 10 days In KMC unit: 0 participants
5.5 Duration of Hyperbilirubinemia phototherapy	Average: 2.5 days Range: 0 - 5 days
5.6 Number of days before bottle / breast fed	Average: 22 days Range: 2 - 42 days
5.7 Number of days in NICU and/or high care	Average: 22.5 days Range: 4 - 41 days
5.8 Other medical conditions in NICU / high care:	
Herpes Zoster infection	1 participant
Blood transfusion	1 participant
Metabolic Acidosis	1 participant
Hypoglycemia	1 participant

According to Table 5 all the perinatal conditions and medical care provided to the participants before KMC commenced can be associated with prematurity and low birth weight. As all the participants were premature and very low birth weight (see Table 1) they were all at risk for the conditions listed in Table 5. These perinatal conditions and subsequent medical care have risks of their own for developmental delays and communication disorders or delays (Klaus & Fanaroff, 2001; Rossetti, 2001; Zaichkin, 1996). A discussion of each condition found in the participants' histories follow:

5.1 and 5.2 According to Table 5, 12 of the 22 participants who received oxygen experienced respiratory distress syndrome (RDS). The condition of RDS was only recorded if it was noted in the participant's medical file. Receiving oxygen in the NICU is usually associated with some degree of RDS that the infant may have. Since 60% of infants born below 32 weeks gestational age is expected to contract RDS (Rossetti, 2001) and most participants were born below this age, it is surprising that not more participants

were diagnosed with the condition. Possible explanations for the low number of participants with RDS may be that:

- Seven of the participants were above the gestational age of 32 weeks. When these participants are excluded the remaining 18 participants, with gestational ages of 32 weeks and younger, were at greater risk to contract RDS. Therefore the percentage of participants with RDS increases from 48% to 67%.
- A large number of care-giving staff are involved with the neonates in a NICU which may contribute to certain medical conditions not being recorded in the neonates' medical files.

Sixty seven percent of the participants who received oxygen and were 32 weeks gestational age and less, therefore experienced RDS. This fairly high percentage of participants who experienced RDS relates to literature which states that RDS is one of the most common factors that co-occurs with prematurity due to the physical immaturity of the preterm neonates' lungs (Askin, 1996; Hagedorn, Gardner & Abman, 2002).

Respiratory disorders are important factors for speech-language therapists to be aware of as the treatment thereof, through prolonged supplemental oxygen, could be a risk factor for sensorineural hearing loss and feeding problems (Arvedson & Brodsky, 2002; Roizen 2003; Rossetti, 2001). As the participants received an average of 26 days of oxygen it is a potential risk factor for later developmental problems. A significant observation is that only five participants received oxygen in the KMC unit. This small number of participants who received oxygen in the KMC unit indicates that these neonates were already physiologically stable, which creates an ideal environment for speech-language therapists to implement ECI programmes.

5.3 and 5.4 Likewise, the number of participants who experienced septicaemia decreased from 40% in the NICU to none in the KMC unit. Once again this trend relates to literature which describes KMC as an intervention strategy which prevents infections. Due to minimal handling by nursing staff and almost exclusive handling by their mothers a decrease in infections can be expected. As breast feeding is also the main feeding

method encouraged in the KMC unit and breast feeding has anti-infective properties, a decrease in infections is facilitated (Hann et al., 1999; Van Rooyen et al., 2002).

5.5 Nine of the participants received phototherapy for an average of two and half days as a treatment strategy for hyperbilirubinemia. Due to the short periods of phototherapy received by the participants it poses no significant risk for their hearing. The severity of hyperbilirubinemia is important for the speech-language therapist to note as elevated levels of bilirubin and an increased duration of hyperbilirubinemia is a risk factor for sensorineural hearing loss (Roizen, 2003).

5.6 Before 32 - 34 weeks gestation the sucking and swallowing reflexes of pre-term neonates' are still too immature and uncoordinated to facilitate successful breast and bottle feeding. Therefore extended periods of nasogastric or orogastric feeding often occur in pre-term infants. An extended period of a supplemental feeding method in the participants is reflected by the average of 22 days after birth before they could start breast and/or bottle feeding (Arvedson & Brodsky, 2002; Blackburn, 1996). Any disturbance in the neonate's ability to feed successfully may pose a risk for developmental progress including future feeding difficulties and communication delays or disorders (Arvedson & Brodsky, 2002; Billeaud & Broussard, 2003).

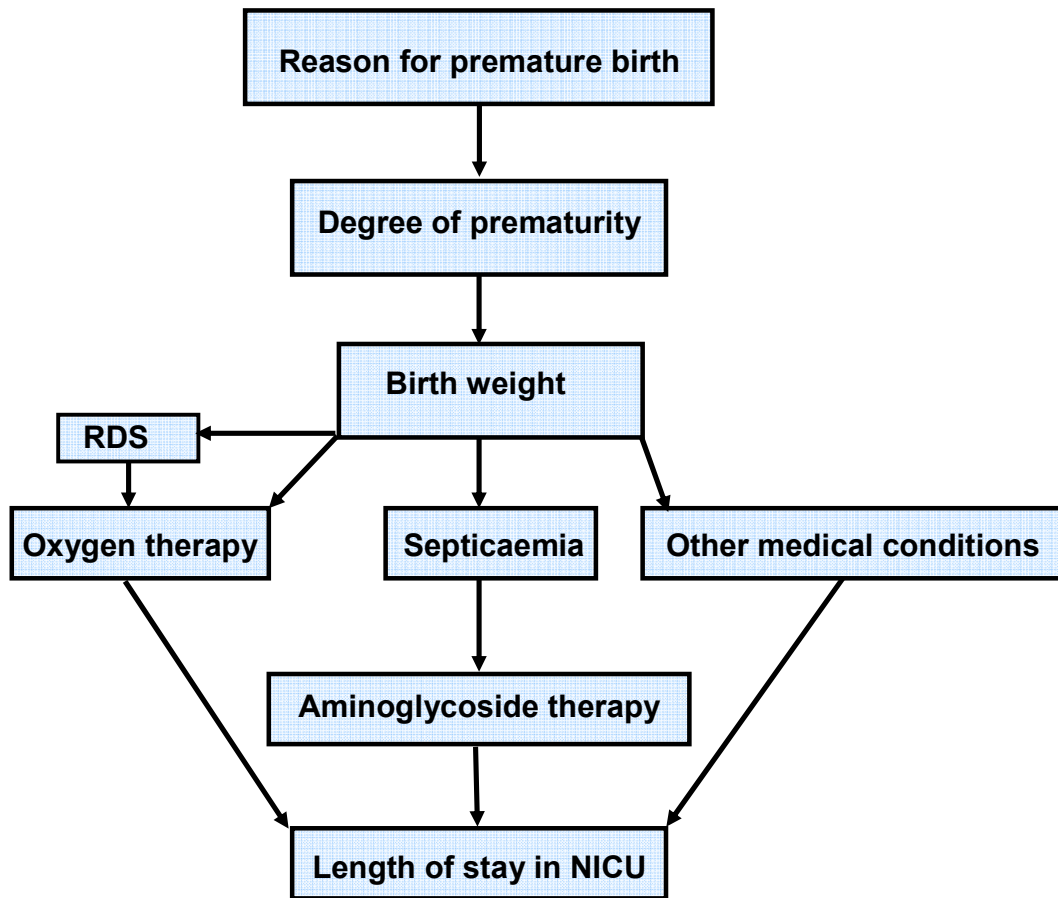
5.7 and 5.8 The extended stay of 22 days in the NICU is a risk factor for developmental delays and specifically communication delays or disorders. For a speech-language therapist involved in a KMC programme it is important to be aware of the neonate's length of stay in the NICU before the commencement of KMC, in order to facilitate knowledge of potential risk factors. The various medical conditions of the participants, related to prematurity and low birth weight, concomitant with the participants' perinatal conditions and medical care are risk factors for prolonged NICU stay.

It is also important to remember that the infants' prolonged NICU stay is characterized by inappropriate patterns of stimulation which interferes with the attachment process between mother and infant after birth (Feldman, 2004; Klaus & Kenell, 2001; Moehn &

Rossetti, 1996; Widerstrom & Nickel, 1997; Young, 1997). Prolonged NICU stay could therefore lead to disrupted interaction patterns between mother and infant, which in turn could negatively impact on the interactive patterns of the infant's first years of life and consequently influence early communication development (Als, 1999; Gottwald & Thurman, 1990; Rossetti, 2001).

The differences between the participants' conditions in the NICU and KMC unit are reflected in the decrease in oxygen dependency and septicaemia. These observations are significant for the speech-language therapist as the participants' physiological stability creates an ideal environment for ECI and mother-infant interaction. The participants were high-risk infants displaying ideal health conditions in the KMC unit which facilitated the observation of their early communicative behaviours during data collection.

Since many of the biological risk factors of the participants were present or commenced in the NICU it is important for the speech-language therapist involved in a KMC programme to examine the neonates' and mothers' medical records holistically to be aware of the risk factors for developmental delays which were present. Figure 4 was compiled as a summary of the factors which were considered to determine the risk profile of the participants. Weight for gestational age was used to determine whether the participants were small-for-gestational age.



**Figure 4. Perinatal factors in the NICU that influenced the participants' risk profile (n=25)**

Figure 4 represents the interacting factors which placed the participants within the high-risk category for communication disorders before admission to the KMC unit.

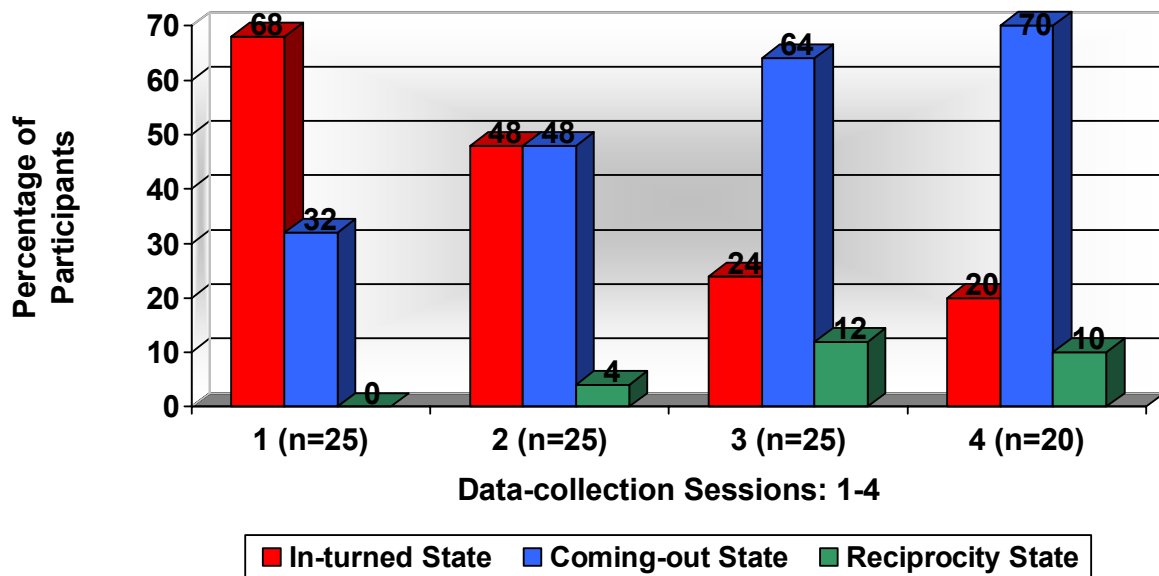
Although the participants entered the KMC unit with improved health, risks for feeding difficulties, poor mother-infant attachment and interaction and developmental delays were already present in the participants. Therefore the different risk factors need to be viewed holistically, as presented in Figure 4, in order for the speech-language therapist to be aware of all the risk factors which could influence feeding and communication development, from the earliest stage.

#### **4.2.2 THE DIFFERENT STATES AND STATE TRANSITIONS OF THE PARTICIPANTS AND THEIR ABILITY TO ESTABLISH ORGANIZED BEHAVIOUR**

To obtain the data concerning the participants' states and state transitions the participants were observed before and during feeding times over a period of 11 days. The variables "organized" or "disorganized" behaviour of the participants were also observed during the same periods according to the Developmental Assessment Scale (Willemse, 2003). Twenty of the participants were observed four times during the two week period and the other five participants were observed three times each. The observed behaviours were recorded in section two of the Data-collection Protocol.

The participants represented a broad spectrum of chronological ages (8-42 days or 26-36 weeks gestational age), during the first data collection which were mainly characterized by the in-turned and coming-out states (Gardner & Goldson, 2002; Gorski et al., 1979).

The participants' developmental states were recorded at the end of every data-collection session after completing the observation of their behaviour, as behavioural states are the behavioural changes that may be observed within one observation sessions (Rossetti, 2001). The developmental state was only recorded at the end of every observation session in order to obtain a representative sample of the participant's behaviour. The developmental state was recorded in section one of the Data-collection Protocol. Figure 5 represents the participants' progress through the three developmental states over the entire period of data collection.



**Figure 5. Participants' developmental states over time**

According to Figure 5 it is clear that the participants' developmental states changed over time. A significant decrease in the in-turned state and increase in the coming-out state indicated that the participants progressed through the developmental states over time.

The decrease in the in-turned developmental state confirms literature findings that the in-turned state decreases as neonates become older and gain physiological stability. During the in-turned state the participants displayed almost no states of alertness (quiet alert, active alert and crying) and mostly remained in some form of sleep state. The participants were easily overwhelmed by environmental stimuli such as noise, light and handling and no reciprocal interactions were observed between them and their mothers (Gardner & Goldson, 2002; Gorski et al., 1979; Willemse, 2000).

During the coming-out state the participants started displaying the full range of sleep and awake states and responded more actively to external stimuli. The increase in the coming-out state reflects the developmental pattern of pre-term and/or low birth weight neonates described in literature. As the participants became older their ability to maintain physiological stability facilitated the progress to the coming-out state (Gardner & Goldson, 2002; Gorski et al., 1979; Willemse, 2000).

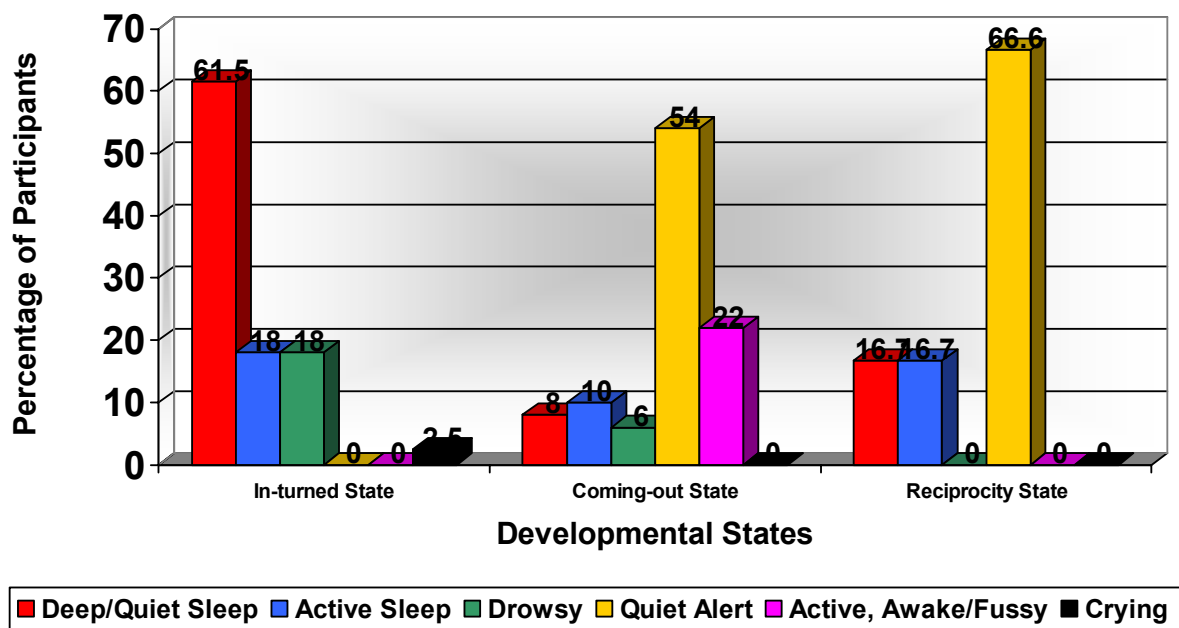
The reciprocity state was not observed during the first data collection as the participants showed no reciprocal interaction with their mothers. The absence of the reciprocity state implies a prolonged presence of the in-turned and coming-out states which may be a protective strategy to foster energy conservation, growth and physiological stability (Gardner & Goldson, 2002). Although there was an increase in the reciprocity state over time, it was not consistently present in the participants. A possible explanation could be inappropriate caregiver responses, which would discourage participants from interacting with their environment, or any factor that could have interfered with the participants' physiological stability (Gardner & Goldson, 2002; Gorski et al., 1979; Willemse, 2000). An increase in the reciprocity state indicates that the participants were ready for more active interaction and that they displayed increased self-regulatory behaviours (Willemse, 2000).

It is significant for the speech-language therapist to note that the developmental states of the participants became more favourable for interaction with the environment and specifically for mother-infant interaction during their stay in the KMC unit. Therefore, as the participants progressed through the various developmental states, advancing from a passive to a more active state, the participants created opportunities for their mothers to respond to them and initiate communication stimulation. As the participants' ability to tolerate more stimulation developed over time it appears that mothers should grade their stimulation according to the development of the neonates' sensory systems (McInroy & Kritzinger, 2005). Grading of sensory stimuli implies that the mothers should follow the successive development of the sensory systems, as described by Gottlieb (1971), according to their infant's developmental state and tolerance of stimulation. It is therefore important for the speech-language therapist to guide the mothers regarding appropriate stimulation of their infants according to the neonate's specific developmental state and accordingly the mothers should only provide those stimuli that the infants can handle without displaying stress responses.

It is well known that neonates display periods of active and quiet behaviour according to six different states of alertness (quiet sleep, active sleep, drowsy, quiet alert, active alert



and crying) within every developmental state (Brazelton, 1973). The participants' states of alertness were observed while they received KMC and during care-giving routines such as feeding and diaper changing. Figure 6 represents the different periods of rest and activity observed in the participants during each developmental state.



**Figure 6. States of alertness according to the participants' developmental states (n=25)**

According to Figure 6 it is evident that participants' deep/quiet sleep state decreased as they progressed through the three developmental states. There was, however, a slight increase of the deep/quiet sleep state during the reciprocity state which could be explained by the fact the participants only displayed sleep and quiet alert states during the reciprocity state. Concomitant with a decrease in the deep/quiet sleep state an increase in the participants' quiet alert state was observed. Very few participants ever displayed the crying and active awake states during observations.

According to KMC studies pre-term and/or low birth weight neonates display increased quiet sleep and alert states when receiving KMC (Feldman, Weller, Sirota & Eidelman, 2002; Messmer et al., 1997; Ohgi et al., 2002). The increase of the quiet alert state over the period of data collection in the participants relates to literature while the decrease of

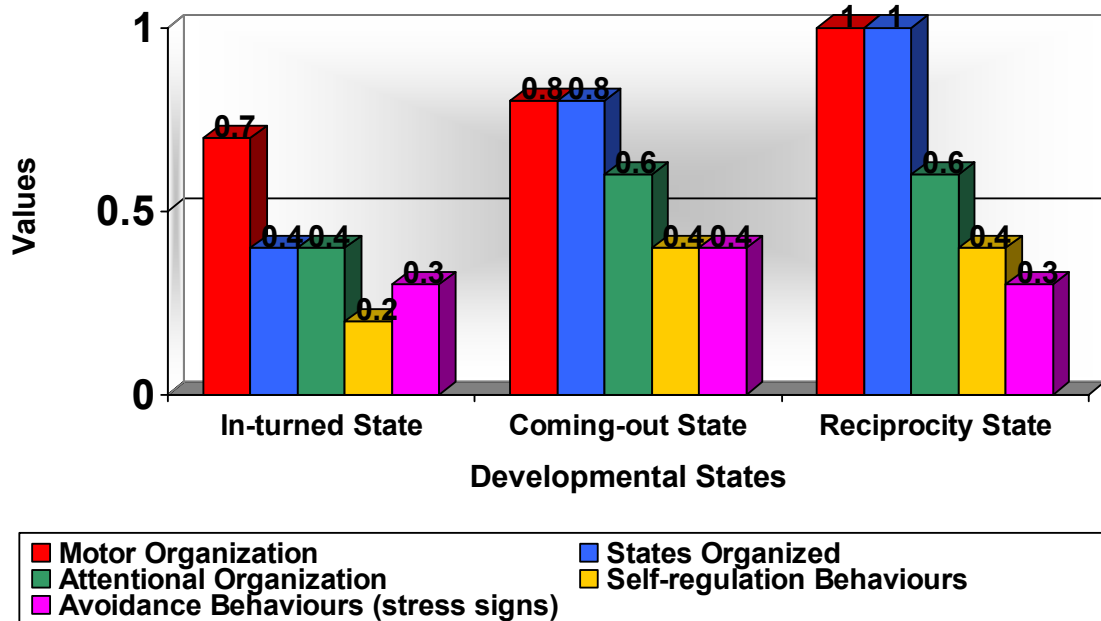
the quiet sleep state in this study appears to be contrary to KMC literature. A possible explanation for this contradiction could be the context in which the participants were observed. The participants were not observed in a context of exclusive KMC but they were also woken by their mothers during observation sessions for diaper changes and feeding times. Another explanation could be that the observation sessions were too short to indicate an increase in the quiet sleep state over the whole data-collection period. An increase in the alert states as the participants progressed through the different developmental states is also a result of the participants' maturation over time (Gardner & Goldson, 2002).

Another interesting observation was that only 2.5% of the participants cried during the in-turned state with no crying behaviour observed during the other two developmental states. According to literature findings pre-term neonates receiving KMC demonstrate no or little crying, which fosters neurobehavioural development (Feldman, 2004; Gardner & Goldson, 2002; Skin-to-skin Programme, 2004). It therefore appears that the practice of KMC in this unit calmed the neonates and consequently primed them for interaction with their environment.

Overall, a decrease in the sleep and transitory states, namely the active sleep and drowsy states, was observed while the participants displayed an increase in their alert states. The participants' progress to states of alertness implies that they became more active over time and were better able to respond to interaction or stimuli from the environment.

Concomitant with the participants' development of states of alertness they also demonstrated progress regarding their ability to organize and regulate their own behaviour. The Developmental Assessment Scale (Willemse, 2003) was used to record the participants' increased ability to organize and regulate their own behaviour.

Figure 7 represents the participants' progress in their ability to organize and regulate their own behaviour.



**Figure 7. Development of organized behaviour during routine care activities performed by the mothers over time (n=25)**

According to Figure 7 the participants' behaviour in the areas of motor organization, state organization and the attentional organization became more organized as they progressed through the three different developmental states. It appears that the participants' self-regulating and avoidance behaviours remained almost constant over the three developmental states. Figure 7 demonstrates that the participants' behaviour was more disorganized in the beginning and became more organized as they developed. As the participants' behaviour was also observed when not in the KMC position, e.g. during feeding times, it is possible that more disorganized behaviour was observed due to the absence of the protective function of the KMC position during feeding times and other care-giving routines.

The upright KMC position in which the participants were carried may have reduced their agitation behaviours and jerky movements which facilitated motor organization (Ludington-Hoe & Swinth, 1996). Although their motor organization improved over time, it was already fairly organized from the first developmental state. The participants'

motor regulation therefore may have improved due to their maturation within the KMC programme, known to foster motor organization (Als, 1999; Ludington-Hoe & Swinth, 1996). The characteristics of motor organization implied that the participants could maintain flexion with minimal or no support while displaying smooth movements of their bodies and limbs (Willemse, 2003).

According to Figure 7 state organization observed in the participants could be classified as disorganized during the in-turned state while becoming more organized in the latter developmental states. The state organization is reflected in a decrease in the overall sleep states and an increase in the participants' ability to sustain the quiet alert state (see Figure 5). Therefore, consistent with literature findings on the effects of KMC the participants' ability to transit between the different states improved, from sleep to aroused states with increasingly longer periods in the alert state (Ludington-Hoe & Swinth, 1996; Ohgi et al., 2002).

The attention/interaction subsystem functions within the quiet alert state which enables infants to focus on and process input from the environment while remaining physiologically stable (Ludington-Hoe & Swinth, 1996; Willemse, 2003). Although the participants' attentional organization, according to Figure 7, remained the same for the coming-out and the reciprocity states, a slight improvement in the organization could be observed compared to the in-turned state. According to Ludington-Hoe and Swinth (1996) the attention/interaction subsystem is rarely observed before 40 weeks gestation, but it was observed that the participants displayed increased habituation to meaningless stimuli such as environmental sounds not directed at them. They were also able to gradually respond to an event as they spent more time in the quiet alert state (Ohgi et al., 2002; Willemse, 2003).

Ludington-Hoe and Swinth (1996) found that self-regulation behaviours are often not observed during KMC, but the participants in this study, however, constantly displayed a fairly high incidence of self-regulatory behaviour throughout the three developmental stages. The self-regulatory behaviour displayed by the participants in Figure 7 could once

again be due to the context in which the participants were observed. Contrary to Ludington-Hoe and Swinth's (1996) study the participants of this study were observed during periods of KMC and during care-giving routines without KMC. The various care-giving routines could have been stressful experiences for the participants as they were removed from the KMC position. It was observed that the mothers did not attempt to reduce their neonates' stress or calm them when not in the KMC position. The absence of KMC during the care-giving routines also exposed the participants to higher levels of noise and light. During the care-giving routines the participants could therefore have had difficulty to maintain a balance of their different developmental subsystems (Gardner & Goldson, 2002; Willemse, 2000). An im-balance in the participants' developmental subsystems could be a possible explanation of the high incidence of stress behaviours, which in itself functions as a protective mechanism against overwhelming environmental stimuli (Feldman, Weller, Sirota & Eidelman, 2002).

It appears that the participants' ability to organize their behaviour within the various neurobehavioural subsystems was their way of communicating whether the environment was supportive of their development or taxing on their functioning. Being able to estimate which care-giving actions support neonatal development may improve the infants' competencies and overall neurobehavioural organization (Als, 1999). Speech-language therapists therefore need to assess the quality of neonatal behaviour as the neonates' progress through the three developmental states. An awareness of the neonates' ability to organize their behaviour throughout the different developmental subsystems is also important as the participants' organized behaviour appears to be related to their feeding behaviour (see Figure 15). The development of the participants' feeding skills throughout the three developmental states will now be discussed.

#### **4.2.3 THE DEVELOPMENT OF NEONATAL FEEDING SKILLS IN THE CONTEXT OF A KMC PROGRAMME**

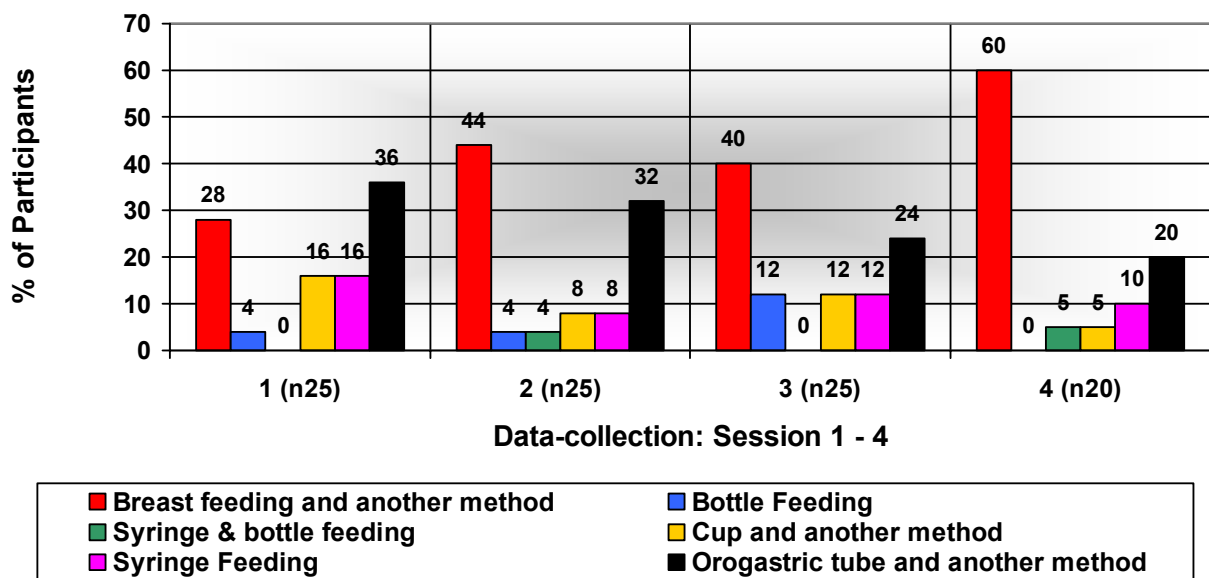
The data regarding the participants' feeding behaviour and skills was recorded during feeding times over a period of two weeks for each of the participants. The participants'

feeding development is described according to the feeding method used, the main state during feeding, their nutritive sucking abilities and oral-motor feeding patterns.

Oral feeding methods were arranged in a sequential order according to the level of dependence. The various feeding methods can be ordered from the most (orogastric tube feeding) to the least (breast and/or bottle feeding) assisted namely:

- Orogastric tube feeding
- Syringe feeding
- Cup feeding
- Breast and/or bottle feeding

Figure 8 represents the methods used to feed the participants and how the feeding methods changed over the different data-collection sessions.



**Figure 8. Participants’ methods of feeding over four times of data collection**

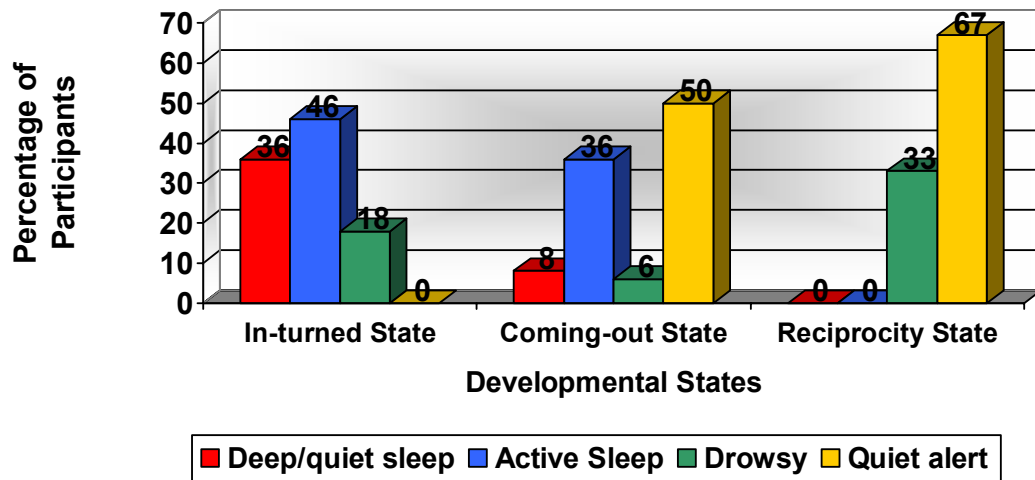
According to Figure 8 there was a decrease in the orogastric tube feeding method and an increase in oral feeding methods. As breast and bottle feeding increased over time syringe and cup feeding decreased over time, thereby indicating that the participants’ suck-swallow-and-breathing sequence became more coordinated over time. According to

Arvedson and Brodsky (2002) as the suck-swallow-and-breathing sequence in pre-term neonates become more coordinated, they are able to feed more efficiently with non-assisted feeding methods.

This progression of feeding methods from most to the least assisted is consistent with the way in which the KMC unit introduces the different methods of feeding, e.g. cup or spoon feeding precedes breast feeding. The high percentage of participants receiving exclusive or partial breast feeding is also consistent with the unit's policy which encourages exclusive breast feeding (Van Rooyen et al., 2002). Another factor that may determine the method of feeding was the participants' mothers' exposure to HIV and AIDS (see Table 1) which necessitated other feeding methods than breast feeding. Since 2001 the Pretoria Pasteurisation method has been used to pasteurise breast milk of mothers who are HIV exposed (Van Rooyen et al., 2002). Therefore appropriate feeding methods must be selected to give the pasteurised breast milk to the neonates. Choice of feeding methods creates an opportunity for speech-language therapists, who have expertise regarding the different feeding methods, to implement a feeding oral sensorimotor programme (Arvedson & Brodsky, 2002).

An oral sensorimotor programme may reduce the great variety of feeding methods used in the KMC unit as the speech-language therapist could teach the mothers strategies to encourage appropriate oral feeding methods i.e. optimal positioning during feeding and non-nutritive sucking stimulation. Non-nutritive sucking is an important intervention technique as it could facilitate quicker transition to oral feeding methods, increase weight gain and promote earlier discharge from hospital (Kalhan & Price, 2001; Wolf & Glass, 1992).

Another important variable to consider when observing pre-term and/or low birth weight neonatal feeding skills is their state of alertness, since the ability to maintain awake states is associated with readiness for oral feeding (Arvedson & Brodsky, 2002; ASHA, 2004). The participants' states of alertness during feeding times are represented in Figure 9.



**Figure 9. Participants' state of alertness during feeding times according to their developmental states (n=25)**

According to Figure 9 only four states of alertness were observed during the participants' feeding times. The active, awake/fussy and crying states were never observed during feeding times. The absence of these two states of alertness may be due to the fact that sucking, which takes place during feeding, functions as a self-regulatory behaviour and encourages sleep and quiet alert states (Als, 1999).

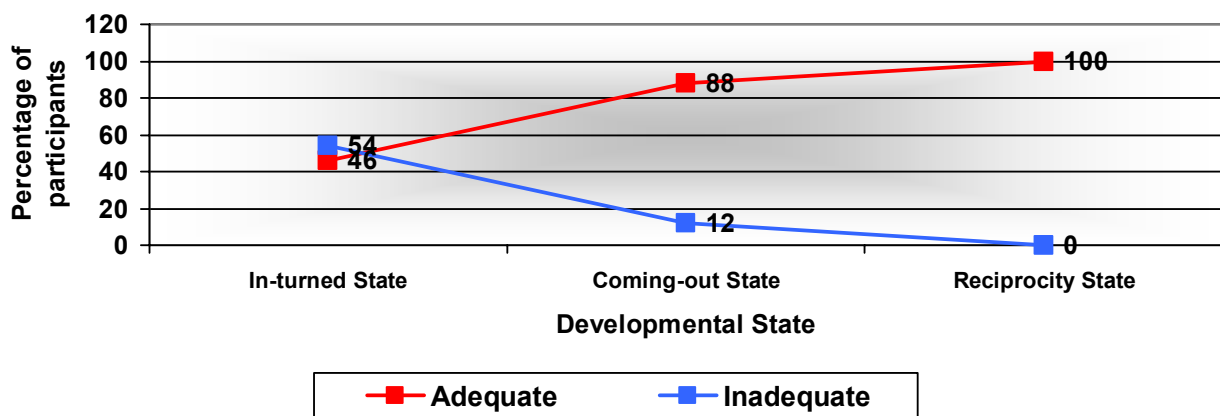
It is also clear that according to Figure 9 there was a decrease in the two sleep states during feeding times and an increase in the quiet alert state. The drowsy state was not consistent throughout the three developmental states. The mothers tried to wake the participants before commencing with feeding. Their activities to wake the participants could possibly be seen in the decrease of the sleep states and the increase of the drowsy state during the reciprocity state when the participants could already be aroused to a certain degree.

During the in-turned state none of the participants were in an awake state for optimal facilitation of feeding. The predominance of sleep states is characteristic of the in-turned state (Rossetti, 2001). As they progressed to the coming-out state half of the participants demonstrated the quiet alert state, which is an indication of readiness for oral feeding. As also indicated by Arvedson and Brodsky (2002) and ASHA (2004) it appears that the



progression of the states of alertness during feeding times facilitated a decrease in assisted methods of feeding and progressively increased the participants' ability to feed with unassisted feeding methods, i.e. breast and/or bottle feeding.

According to Hall (2001) readiness for oral feeding can also be determined by the presence of the rooting reflex, the suck-swallow-and-breathing sequence and the strength of an infant's sucking reflex. These three variables were observed and indicated as present or absent over time and cumulatively presented as the participants' quality of nutritive sucking skills. Figure 10 represents the percentage of participants' who demonstrated adequate and inadequate nutritive sucking skills during each developmental state.



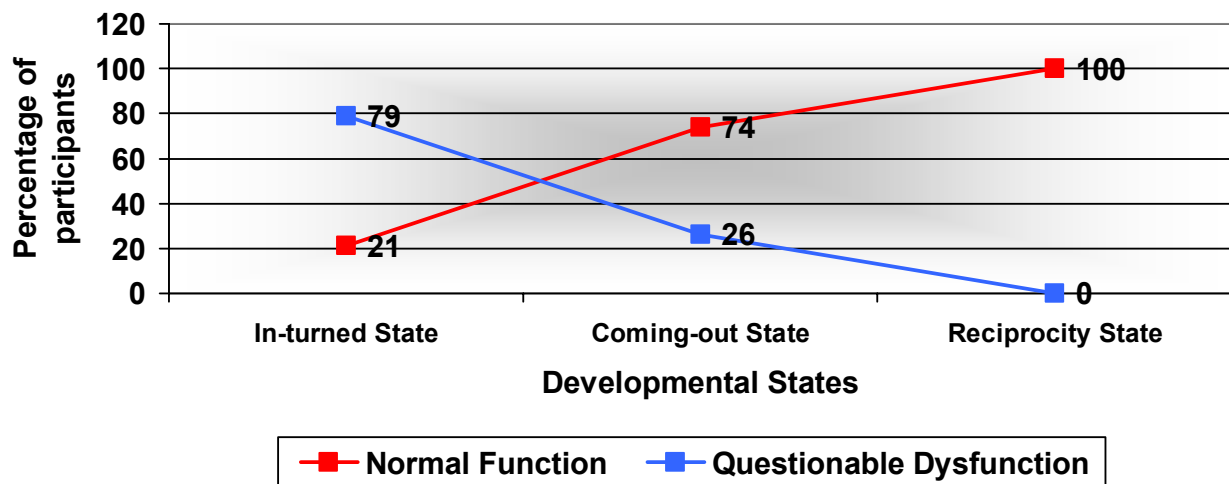
**Figure 10. Participants' nutritive sucking skills during each developmental state (n=25)**

According to Figure 10 the participants' nutritive sucking skills were characterized by a simultaneous increase in the adequacy and a decrease in the inadequacy of their nutritive sucking skills. Therefore the participants were increasingly able to feed by means of oral feeding methods as their nutritive sucking skills developed (see Figure 8). The gradual progress to oral feeding observed in the participants corresponds with literature which states that premature neonates can suckle and swallow well enough at approximately 34 weeks to meet their nutritional needs via oral feeding. Thirty four weeks is also the beginning of the coming-out state (Rossetti, 2001). Therefore an increase in gestational

age is related to the successful coordination of the suck-swallow-and-breathing sequence to support oral feeding (Arvedson & Brodsky, 2002; Wolf & Glass, 1992).

The coming-out state (34 weeks) appears to be the turning point for the participants in their improvement of nutritive sucking skills. This improvement in feeding skills during the coming-out state is consistent with literature that describes the coming-out state as the first state during which the neonate responds to the environment in both a nutritional and social manner (Rossetti, 2001).

Concurrently with the participants' progress of their nutritive sucking skills their oral-motor feeding patterns were also tracked. This was done by recording whether the participants' lip/cheek, tongue and jaw movements were normal or dysfunctional. Figure 11 represents the percentage of the participants' who displayed normal and dysfunctional oral-motor feeding patterns as they progressed through the developmental states.



**Figure 11. The oral-motor feeding patterns of the participants during each developmental state (n=25)**

According to Figure 11 more participants displayed functional oral-motor skills as they progressed through the three developmental states. Once again the trend that can be observed is one of simultaneous increase in normal functioning and a decrease in dysfunction. This increase in normal functioning appears to be consistent with both the

increase in the nutritive sucking skills and the quiet alert state as the participants progressed through the three developmental states (see Figure 9 and 10). Once again the coming-out state appears to be the turning point for the participants' increase in normal oral-motor feeding patterns.

The developmental trend of the participants' feeding behaviour appears to be similar to the developmental pattern of premature neonates as described in literature (Arvedson & Brodsky, 2002; Wolf & Glass, 1992). The pattern of development reflects a more coordinated sequence of suck-swallow-and-breathing while oral-motor patterns became more functional in order to facilitate oral feeding from the most to least assisted method. The progress of the participants feeding skills in the context of a KMC programme reflects the principles of KMC which encourages exclusive breast feeding and the finding that this intervention method enhances readiness for oral feeding (Anderson et al., 2004; ASHA, 2004; Feldman et al., 2002; Hann et al., 1999; Hurst et al., 1997).

A question, however, arises regarding the speech-language therapist's involvement with oral sensorimotor intervention in a KMC unit as no feeding intervention by a speech-language therapist was provided during the time of data collection. Although the participants' feeding skills developed positively over time it may be possible that early oral sensorimotor intervention would have facilitated a quicker and more effective progress from assisted feeding to oral feeding methods as non-nutritive sucking has been associated with a more rapid transition to oral feeding (Arvedson & Brodsky, 2002).

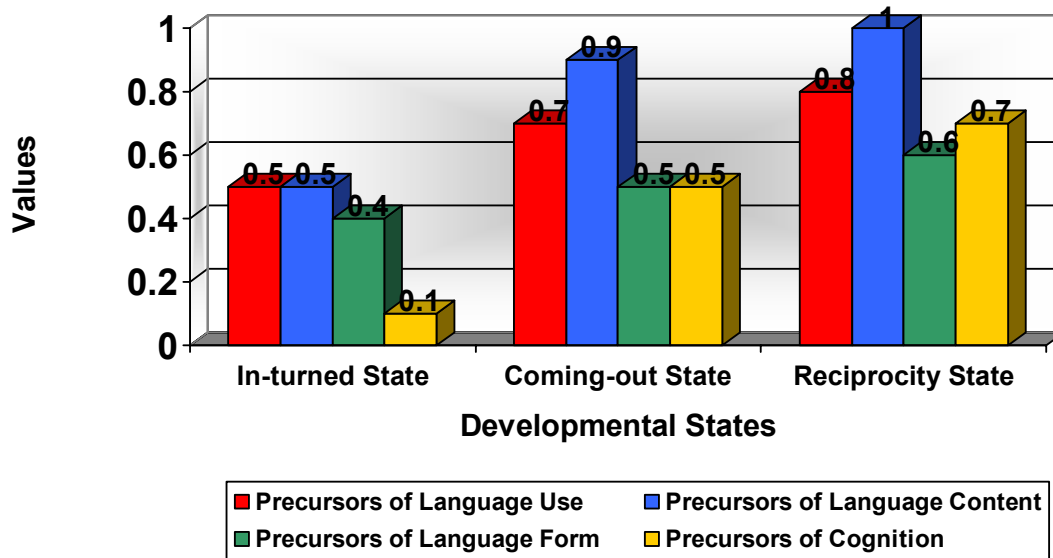
A rapid transition to oral feeding is an important factor for speech-language therapists to consider as extended periods of supplemental feeding are a risk factor for communication disorders (Arvedson & Brodsky, 2002). Although the participants in this study progressed from orogastric feeding to oral feeding methods they were already exposed to periods of supplemental feeding, via oro-gastric or naso-gastric tube feeding, in the NICU prior to admission to the KMC unit (see Table 5). These periods of supplemental feeding prior to admission to the KMC unit emphasizes the need to minimize the number of days the participants should receive supplemental feeding in the KMC unit. Therefore it appears

that the speech-language therapist could play a role in the KMC unit regarding oral sensorimotor intervention since Van Rooyen et al. (2002) reported that successful oral feeding is a criterion for discharge from the KMC unit. Further research is, however, required to guide the speech-language therapist regarding an appropriate oral sensorimotor programme in the KMC unit.

As the vegetative functions of the oral mechanism form the foundation for later oral communication functions it also serves as a motivation for speech-language therapists' involvement in ECI in the KMC unit (Billeaud & Broussard, 2003; Humphry, 1995). A description of the participants' communication development follows to provide a sample of how communication development takes place in a KMC unit.

#### **4.2.4 NEONATAL COMMUNICATION DEVELOPMENT**

The participants' communication development was recorded by observing their behaviour throughout the entire observation session and was recorded as precursors of language development in section 4 of the Data-collection Protocol. Figure 12 represents the participants' development of precursors of language by including the different areas of language development as it developed over time, as well as including the precursors of cognitive development. Figure 12 was compiled to represent the average values for each precursory developmental area and how it changed over time. The values allocated to the behaviours were calculated as absent (0) and present (1). Thereafter Table 6 represents a detailed view of the behaviours which constitute each precursor of language and cognitive development.



**Figure 12. Precursors of language development over time (n=25)**

According to Figure 12 it is clear that all the precursors of language development increased as the participants progressed through the developmental states. Precursors of cognition were almost completely absent during the in-turned state but progressively emerged throughout the last two developmental states. All the precursors of language content were observed when the participants entered the reciprocity state. The precursors of language use and form were respectively 50% and 40% present during the in-turned state and 80% and 60% present during the reciprocity state. It therefore appears that most of the precursors of language development were already present during the in-turned state and increased during the last developmental states.

The development of precursors of language content (listening skills) appears to be the most advanced area of development in the participants during the reciprocity state.

Table 6 represents the different behaviours which constitute each precursor of language and cognitive development. Each behaviour is presented according to the percentage of participants who displayed the behaviour during a specific developmental state.

**Table 6. Behaviours displaying the various precursors of language and cognitive development (n=25)**

<b>PRECURSORS OF LANGUAGE USE</b>			
	In-turned State	Coming-out State	Reciprocity State
1. Synchronized interaction with person	0%	0%	83%
2. Imitates a person: stretch eyes, open mouth, protrude tongue	0%	2%	100%
3. Makes momentary eye contact	10%	86%	100%
4. Noticeable reaction to person	41%	96%	100%
5. Stops crying when picked up	87%	100%	100%
6. Reflexive smile	92%	98%	100%
7. Accepts cuddling	97%	100%	100%
<b>PRECURSORS OF LANGUAGE CONTENT</b>			
	In-turned State	Coming-out State	Reciprocity State
1. Listens to speaker	3%	50%	100%
2. Mother draws neonate's attention through vocalization	41%	94%	100%
3. Calmed by person's voice	61%	94%	100%
4. Preference for mother's voice	71%	98%	100%
5. Reflexive responses to sound	95%	100%	100%
<b>PRECURSORS OF LANGUAGE FORM</b>			
	In-turned State	Coming-out State	Reciprocity State
1. Cries often	0%	0%	0%
2. Cry in reaction to another's cry	0%	2%	0%
3. Undifferentiated cry	5%	2%	0%
4. Vocalizes in reaction to mother's speech and touch	13%	22%	100%
5. Non-reflexive vocalizations	26%	62%	100%
6. Negative sounds: suck, swallow, yawn, hiccup, winds, snore, sigh, sneeze, cough	51%	72%	83%
7. Differentiated cry	62%	96%	100%
8. Produces sounds of discomfort	95%	94%	100%
<b>PRECURSORS OF COGNITION</b>			
	In-turned State	Coming-out State	Reciprocity State
1. Protective reaction with cloth over face	0%	0%	0%
2. Adaptive behaviour after repetitive stimuli	0%	0%	17%
3. Gives momentary attention to red ring	0%	42%	100%
4. Self-regulating behaviour: Sucks hand	0%	44%	67%
5. Looks around	10%	90%	100%
6. Self-regulating behaviour: Uses visual & auditory stimuli from environment	13%	74%	100%
7. Self-regulating behaviour: Hand to mouth	33%	72%	83%

**(Shaded cells: Behaviours not fully developed during the reciprocity state)**

When considering the behaviours categorized under the different precursors of language and cognitive development in Table 6 it is clear that precursors of cognition were the least observed during the in-turned state. Precursors that were most observed during the in-turned state were language content i.e. the neonates' listening behaviour. Precursors of language form were the least developed during the reciprocity state while all precursors of language content were present during the reciprocity state. Those items of precursors of language form which express discomfort were not fully developed. Since the participants displayed very little crying in the context of KMC it could be a possible reason why the precursors of language form were not fully developed by the reciprocity state (see Figure 6).

It is also evident that participants' tactile sensory system appeared to develop first. The development of the tactile system is reflected in the high percentage of participants displaying behaviours such as: (1) stops crying when picked up and (2) accepts cuddling in the in-turned state. These behaviours developed from 87% and 97% respectively in the in-turned state to 100% in the coming-out state. The participants' auditory system appeared to develop next. All the behaviours which are classified as precursors to language content are responses to auditory stimuli. These behaviours as a group developed from 54% in the in-turned state to a 100% in the reciprocity state. The visual system developed lastly as reflected in the following behaviours: (1) makes momentary eye contact, (2) imitation of person, (3) gives momentary attention to red ring and (4) looks around. Momentary eye contact and looking around progressed from 10% in the in-turned state to 100% in the reciprocity state. Both imitation of a person and giving momentary attention to a red ring progressed from 0% in the in-turned state to a 100% in the reciprocity state.

The successive emergence of the different components of language and cognitive skills is consistent with Gottlieb's (1971) theory on the sequential development of the fetal sensory systems. The sequence of the participants' development of the sensory system is exactly the same as Gottlieb (1971) proposed namely first tactile, then auditory and lastly the visual system. Subsequent studies also confirmed this progression of fetal sensory

development by system (Lotas, King & King, 2004). It also relates to research which found that KMC provides tactile and proprioceptive stimulation in the beginning while protecting the neonate from adverse visual and auditory stimuli (Feldman et al., 2002; Feldman & Eidelman, 2003). The sequential development of the participants' senses also appears to be consistent with the results of a single case study of the communication development of a high-risk neonate in the context of a NICU (McInroy & Kritzinger, 2005).

According to McInroy and Kritzinger (2005) the neonate firstly displayed hearing responses, followed by vocal expressions and lastly interactive communication skills. This sequential development can also be expressed in the order in which the precursors of language developed in the participants namely, language content (hearing), form (vocal expression) and use (interactive communication skills guided by vision). In the context of a KMC programme precursors of language content still appeared to develop first while precursors of language use developed second and precursors of language form last (see Figure 12). Therefore, the order in which precursors of language form and use developed differed from McInroy and Kritzinger (2005). This difference can possibly once again be due to the limited crying behaviour, the main characteristic of language form, the participants displayed, in the context of KMC (see Figure 6). Although the findings of a single case study (McInroy & Kritzinger, 2005) and that of the present study cannot fully be compared, it may be that the calming effect of KMC inhibited the participants' crying, which is reflected in the development of precursors of language form.

The evidence that the sensory systems of pre-term and /or low birth weight neonates appear to develop in a specific order according to the immediate environment points to further research and emphasizes the need for individualized ECI programmes for high-risk neonates. It is important for the speech-language therapist to consider this sequential development of the sensory systems as to provide guidelines for the gradual introduction of sensory experiences according to the neonate's individual level of functioning within the context of a KMC programme.



According to Table 6 there were two significant precursors of development that were not developed fully during the reciprocity state. Firstly, the participants did not display 100% synchronized interaction with people during their stay in the KMC unit and secondly, only 17% of them could adapt to repetitive stimuli. The participants' limited display of synchronized interaction with their mothers could be explained by the following results in Figure 13.

#### 4.2.5. MOTHER-NEONATE COMMUNICATION INTERACTION

Mother-neonate communication interaction was observed throughout each observation session whenever interactive behaviour occurred between the mother and participant. The interactive behaviour was recorded in Section 5 of the Data-collection Protocol. Behaviours were recorded according to a nominal scale of 1 - 4 with 1 representing absence of behaviour and 4 representing behaviours which were optimally present. Figure 13 represents the mother-neonate communication interaction as it changed according to the participants' progression through the developmental states.

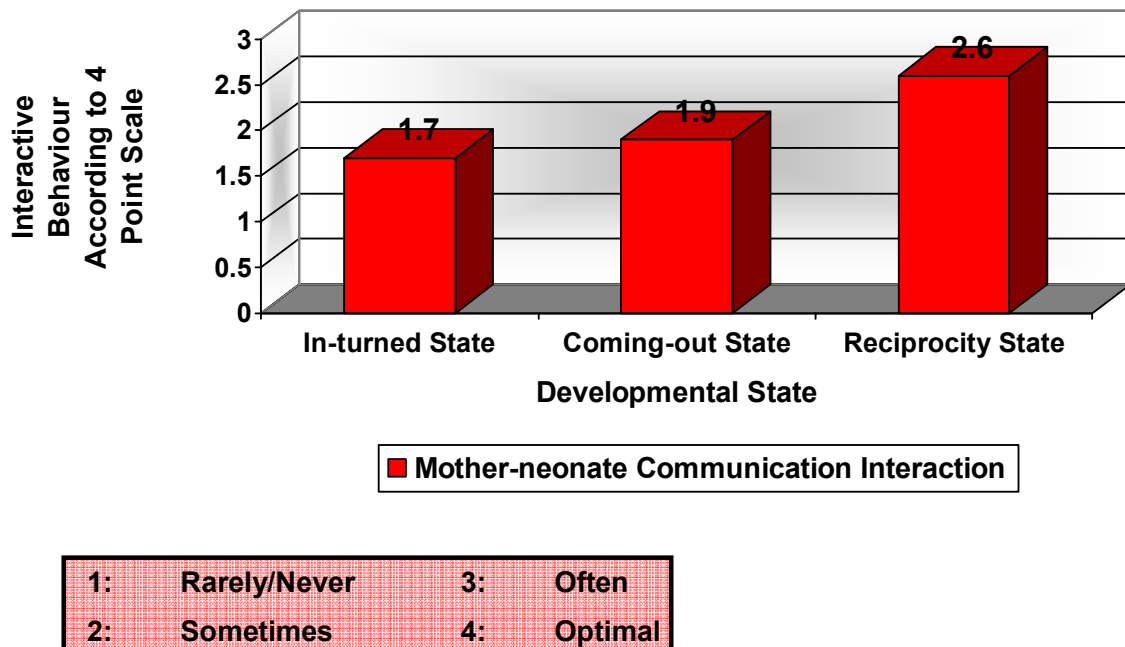


Figure 13. Mother-neonate communication interaction (n=25)

According to Figure 13 it is clear that the mothers became more responsive to their neonates' behaviours as the participants progressed through the various developmental states. It is also evident that mother-neonate interaction only reached a level of 2.6 by the reciprocity state whereas optimal interaction would have been 4. This implies that mother-neonate interaction was only "sometimes" present during the periods in which mother-neonate interaction was possible.

The reason could have been a lack of opportunities for the mothers and their infants to engage in interactive behaviour. The participants' inability to adapt to environmental stimuli (see Table 6) implies that they reacted to environmental stimuli such as noise, handling and light whether specifically directed at them or not. Regardless of the reasons for the participants' inability to establish synchronized interaction and adapt to environmental stimuli, it will have an impact on the speech-language therapist's ECI programme in the context of a KMC programme. It could mean that the speech-language therapist should train the mothers regarding the neonates' ability and cues for interaction and how to create an optimal environment to prevent over stimulation.

Table 7 represents the different components of mother-neonate interaction and how it developed over time. Each component is described by the percentage of participants who displayed the behaviour at a developmental state.

**Table 7. Components of mother-neonate interaction (n=25) (based on Klein & Briggs, 1986)**

<b>Components of Interaction</b>	<b>In-turned State</b>	<b>Coming-out State</b>	<b>Reciprocity State</b>
1. Provides appropriate tactile & kinaesthetic stimulation to infant	Rarely: 5%	Rarely: 0%	Rarely: 0%
	Sometimes: 18%	Sometimes: 6%	Sometimes: 0%
	Often: 72%	Often: 76%	Often: 33%
	Optimal: 5%	Optimal: 9%	Optimal: 67%
2. Displays pleasure while holding and taking care of infant	Rarely: 36%	Rarely: 50%	Rarely: 17%
	Sometimes: 56%	Sometimes: 34%	Sometimes: 0%
	Often: 8%	Often: 16%	Often: 83%
	Optimal: 0%	Optimal: 0%	Optimal: 0%
3. Responds to infant's distress	Rarely: 0%	Rarely: 2%	Rarely: 0%
	Sometimes: 82%	Sometimes: 80%	Sometimes: 50%
	Often: 18%	Often: 12%	Often: 50%
	Optimal: 0%	Optimal: 6%	Optimal: 0%
4. Positions herself and infant so that eye-to-eye contact is possible	Rarely: 18%	Rarely: 0%	Rarely: 0%
	Sometimes: 56%	Sometimes: 46%	Sometimes: 17%
	Often: 26%	Often: 48%	Often: 33%
	Optimal: 0%	Optimal: 6%	Optimal: 50%
5. Smiles contingently at infant	Rarely: 38%	Rarely: 58%	Rarely: 17%
	Sometimes: 59%	Sometimes: 28%	Sometimes: 33%
	Often: 3%	Often: 14%	Often: 50%
	Optimal: 0%	Optimal: 0%	Optimal: 0%
6. Varies prosodic features when talking to infant	Rarely: 100%	Rarely: 98%	Rarely: 50%
	Sometimes: 0%	Sometimes: 0%	Sometimes: 50%
	Often: 0%	Often: 2%	Often: 0%
	Optimal: 0%	Optimal: 0%	Optimal: 0%
7. Encourages conversation with infant	Rarely: 72%	Rarely: 56%	Rarely: 17%
	Sometimes: 26%	Sometimes: 38%	Sometimes: 0%
	Often: 2%	Often: 6%	Often: 83%
	Optimal: 0%	Optimal: 0%	Optimal: 0%
8. Responds contingently to infant's behaviour	Rarely: 3%	Rarely: 2%	Rarely: 0%
	Sometimes: 87%	Sometimes: 80%	Sometimes: 33%
	Often: 10%	Often: 18%	Often: 67%
	Optimal: 0%	Optimal: 0%	Optimal: 0%
9. Modifies interaction in response to negative cues from infant	Rarely: 5%	Rarely: 4%	Rarely: 0%
	Sometimes: 67%	Sometimes: 76%	Sometimes: 50%
	Often: 28%	Often: 20%	Often: 50%
	Optimal: 0%	Optimal: 0%	Optimal: 0%
10. Uses communication to teach language & concepts	Rarely: 87%	Rarely: 64%	Rarely: 17%
	Sometimes: 10%	Sometimes: 30%	Sometimes: 17%
	Often: 3%	Often: 6%	Often: 66%
	Optimal: 0%	Optimal: 0%	Optimal: 0%

**(Shaded cells: Developmental trend displayed by majority of the participants)**

According to Table 7 there were only two components of mother-neonate communication interaction which developed optimally namely: (1) providing appropriate tactile and kinaesthetic stimulation and (2) positioning self and infant so eye-to-eye contact was possible. It is also evident that all the components progressed from the in-turned state to the reciprocity state. This appears to be consistent with the participants' state of development which progressed from a passive to a more active state (see Figure 5). Eight of the ten components did, however, not reach an optimal level.

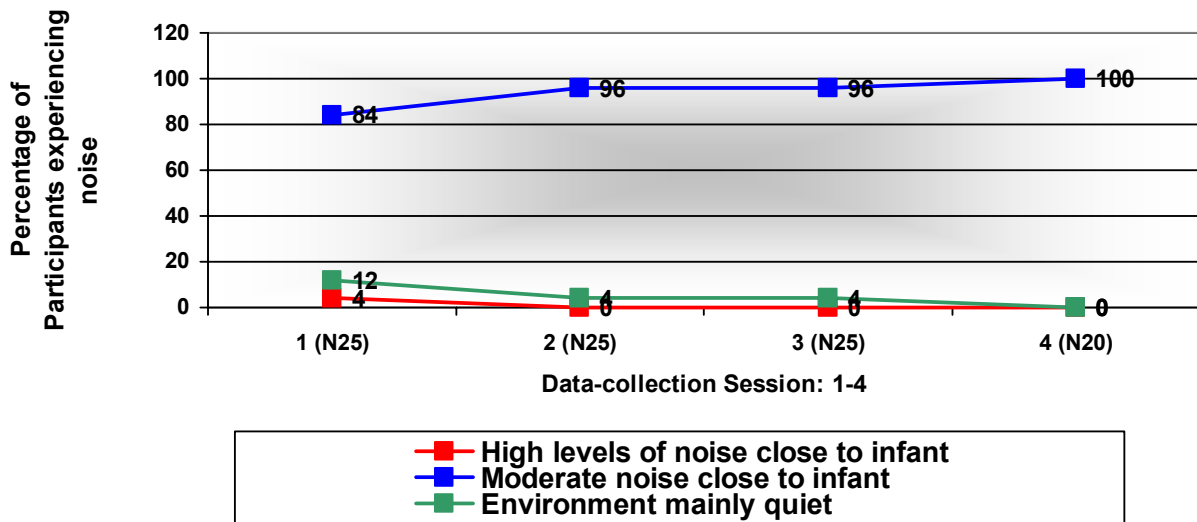
The low level of mother-neonate interaction could be related to some of the participants not progressing to the reciprocity state in the KMC unit and therefore not being ready for interaction with the environment. Another explanation could be that the mothers were not aware of the participants' communicative cues and did not respond appropriately in order to establish mother-neonate communication interaction. The components in Table 7 which included any type of verbalization from the mother, such as numbers 3, 6, 7 and 10 appeared to develop poorly. From the observation sessions it was evident that the mothers did not use much verbal behaviour during their interaction with their infants. Two of the four components, numbers 3 and 6, necessitating verbal behaviour were only "sometimes" present while numbers 7 and 10 were present "quite often", but not "optimally".

The quality of mother-neonate interaction in the KMC unit is an important area of development for the speech-language therapist to assess, since attachment forms the basis of early communication development (Billeaud, 2003). According to Table 7 it appears that most of the mothers could have benefited from an ECI programme as to establish optimal levels of mother-neonate communication interaction. Contrary to McInroy and Kritzinger (2005) who indicated little change in mother-neonate interaction in the context of a NICU, this study reflects an improvement in mother-neonate interaction over time. This is consistent with literature findings that KMC increases maternal sensitivity and responsiveness (Ohgi et al., 2002).

It is important to facilitate well developed mother-neonate communication interaction dyads in a KMC unit since typical newborns have a preference for their mothers' voices and prenatal experiences of maternal voices may influence early language acquisition (Krueger, Holditch-Davis, Quint & DeCasper, 2004). As the auditory system seems to be the second sensory system of the participants to develop (see Table 6), appropriate auditory stimulation is essential. It has also been argued that language learning starts prior to birth in the fetal stage (Krueger et al., 2004). The participants of this study were all premature which means that they were actually fetuses developing in an extra-uterine environment. The KMC unit therefore is a potential language learning environment for the premature and/or low birth weight neonates. This is an opportunity for speech-language therapists to implement ECI programmes in order to prevent later communication delays or disorders.

#### **4.2.6 THE ENVIRONMENT OF THE KMC UNIT**

Data regarding the environment of the KMC unit was recorded in section 3 of the Data-collection Protocol. The environment of the KMC unit is described according to the lighting and noise levels in the participants' environment. Throughout all the observation sessions there was natural light in the participants' surrounding environment. This appears to be acceptable as it was natural light shining through a row of windows just below the ceiling and no bright light shone directly on the participants. Figure 14 represents the levels of noise in the KMC unit across the various data-collection sessions.



**Figure 14. KMC unit in terms of noise levels**

According to Figure 14 the noise in the KMC unit was mostly characterized by moderate levels close to the infant. High levels of noise rarely occurred, but the environment was also rarely quiet. The noise was mainly characterized by human voices, movement and the handling of objects.

Both the lighting and noise levels in the KMC unit seemed to be acceptable for the neurobehavioural development of the participants (Als, 1999; Willemsse, 2000). This confirms KMC as a developmentally appropriate intervention strategy as detrimental stimuli is reduced by keeping the infants close to the mothers and closing their ears with a wrap (Ludington-Hoe & Swinth, 1996; Young, 1997). This favourable environment could be due to the limited number of staff involved in the KMC unit and care-giving mainly being done by the mothers themselves (Van Rooyen et al., 2002). This quiet environment which fosters neonatal development could also be related to the mothers' sensitivity toward their infants which is nurtured within the KMC programme (Feldman, 2004; Koch, 1999).

### **4.3 CONCLUSION**

The aim of this chapter was to provide a description of neonatal communication and feeding development as it occurred in the context of a KMC unit within the framework of the participants' general development. It was established that all the participants were in the high-risk category for communication disorders.

Over time it became clear that the participants progressed from passive to more active developmental states, but displayed very little crying behaviour in the context of KMC. Concomitant with the participants' increase in state of alertness they also displayed the ability to organize and regulate their behaviour over time. The participants' nutritive sucking skills and oral-motor feeding patterns developed over time resulting in an increased ability to feed orally. Precursors of language and cognitive development also appeared to increase over time in a specific order and confirmed the sequential development of pre-term neonates' sensory systems. The order of sensory development appear to be firstly tactile, then auditory and lastly the visual system.

Regardless of the participants' development in different areas and specifically in the area of communication development, mother-neonate interaction never reached an optimal level of functioning. Limited development of mother-neonate interaction in an environment which should facilitate and support mother-neonate attachment and interaction, emphasises the role of the speech-language therapist to develop individual ECI programmes for neonates and train mothers according to the neonates' individual developmental progress.

### **4.4 SUMMARY**

In this chapter the results were represented and discussed according to the aim specified in chapter three. The results of 25 participants were described according to each individual developmental area. Developmental progress over time in all developmental areas was well established in the participants, providing a foundation for speech-language

therapists to develop holistic individualized ECI programmes in the context of a KMC unit. Specific areas for speech-language therapy services in the KMC unit were identified.



## CHAPTER 5

### CONCLUSION AND RECOMMENDATIONS

***Aim:** To present trustworthy and objective conclusions to the questions posed earlier in the study. The theoretical orientations of chapters One and Two are used to provide a conclusion and clinical implications of the study as a whole. The study is also evaluated and recommendations for further research are made.*

#### 5.1 BRIEF SUMMARY OF MOST IMPORTANT RESULTS

This study provided a rich description of the developmental progress of very low birth weight neonates, within the high-risk category for communication disorders, from admission to discharge from a KMC unit. Consistent with literature this study portrays KMC as an intervention method that supported the participants' physiological stability and consequently created an ideal environment for ECI and mother-neonate interaction. Within the context of the participants' physiological stability in the KMC unit, the study provided an exposition of the participants' development within the areas of neurobehavioural organization, feeding, communication and mother-neonate interaction.

The study highlighted the increase of the participants' state of alertness as they became older which facilitated more favourable behaviour for interaction with their environment. The participants' development of precursors of language confirms that pre-term and/or low birth weight neonates' sensory systems develop in a specific order and therefore necessitates graded sensory stimulation according to the neonates' specific level of functioning and developmental state (McInroy & Kritzinger, 2005).

As the participants developed throughout the three developmental states it was clear that their feeding skills improved with regard to their suck-swallow-and-breathing sequence and oral-motor feeding patterns, which facilitated the transition from assisted to non-assisted feeding methods. The participants' feeding development was observed without

the implementation of early feeding intervention and therefore the question arises regarding the need for oral sensorimotor intervention. Non-nutritive sucking may be used as a method to facilitate more efficient feeding patterns and quicker transition from assisted to non-assisted feeding methods (Arvedson & Brodsky, 2002).

Although the participants' behaviour and communication development, within an environment which facilitates mother-infant attachment (Feldman, 2004), provided a suitable context for mother-neonate interaction, the study revealed that optimal levels of mother-neonate interaction were rarely present. This mismatch between the participants' development and mother-neonate interaction provides strong evidence for the need of an ECI programme in the KMC unit. Such a programme should focus on teaching mothers specific strategies to appropriately interact with their infants as they progress through the different developmental states and according to their sensory system development.

## **5.2 CONCLUSION AND IMPLICATIONS**

The most important results and implications of the results are discussed according to the different sub-aims used to observe and describe the neonates' developmental progress in the KMC unit.

### **5.2.1 HISTORY OF PERINATAL CONDITIONS AND MEDICAL CARE OF THE PARTICIPANTS**

As a result of the participants' perinatal conditions and extended medical care in the NICU prior to KMC it was clear that they were in the high-risk category for developmental delays and specifically communication delays or disorders (Klaus & Fanaroff, 2001; Rossetti, 2001; Zaichkin, 1996). It was significant to note that the risk conditions such as RDS, lengthy periods of oxygen therapy, septicaemia, hyperbillirubinemia and other medical conditions mostly occurred while the participants were still in the NICU. Therefore, the absence of serious conditions such as oxygen dependency and septicaemia in the KMC unit facilitated the participants' physiological

stability which in turn created an ideal environment for ECI and mother-infant interaction.

It is therefore crucial for the speech-language therapist to recognize the KMC unit as an ideal opportunity to initiate ECI programmes. As very low birth weight and extreme premature birth are the greatest risks for developmental delays and specifically communication delays (Rossetti, 2001) it is important for the speech-language therapist involved in a KMC programme to understand the individual infant's risk factors. Insight into the interactive nature of the neonate's risk factors will make the speech-language therapist aware of the continuum of risk for the specific neonate which starts very early in life and may continue for an extended period to affect communication development and school success. The continuum of risk for each infant should therefore guide the ECI programme implemented in the KMC unit (Rossetti, 2001).

### **5.2.2 THE DIFFERENT STATES AND STATE TRANSITIONS OF THE PARTICIPANTS AND THEIR ABILITY TO ESTABLISH ORGANIZED BEHAVIOUR**

As the participants developed during the average period of 11 days that they were observed, they gained physiological stability and fewer participants were in the in-turned state and more participants reached the coming-out state. Therefore the participants progressed from a passive to a more active developmental state which created opportunities for interaction with their environment and specifically for mother-neonate interaction.

Within the different developmental states, over time, the participants displayed a decrease in the deep/quiet sleep state and an increase in the quiet alert state. An interesting observation, which is confirmed in KMC literature (Feldman, 2004), was the minimal crying behaviour displayed by the participants in the KMC unit. The two main states of alertness observed throughout the participants' stay in the KMC unit were the deep/quiet sleep state and alert states which is consistent with KMC research studies (Feldman et al., 2002; Ohgi et al., 2002). The quiet sleep state is an optimal state to protect neonates from

the extra-uterine environment while the alert states imply that the participants became more active over time and able to respond to interaction or stimuli from the environment.

Concomitant with the participants' development of states of alertness they also demonstrated progress regarding their ability to organize and regulate their own behaviour over the average of 11 days of observation. As the participants progressed through the three different developmental states their behaviour in the areas of motor organization, state organization and attentional organization became more organized. It appears that the participants' ability to organize their behaviour within the different neurobehavioural subsystems was their way of communicating whether the environment was supportive of their development or inhibiting their functioning.

As the participants progressed through the three developmental states and demonstrated more states of alertness they could consequently tolerate more stimulation from the environment. Being able to handle more stimulation made it important for the participants' mothers to grade their stimulation according to the development of the neonates' sensory systems. Grading their stimulation would also include that the mother is able to estimate which care-giving actions support neonatal development and may improve the neonate's competencies and overall neurobehavioural organization. With very young neonates, mothers' care-giving actions such as diaper changing will focus on giving the neonate positive and secure tactile input while reducing or eliminating auditory and visual input.

The speech-language therapist therefore needs to identify the quality of neonatal behaviour and developmental state, as the neonates' progress through the developmental states, in order to guide the mothers regarding appropriate stimulation of their neonates according to their developmental state. Over the 11 days of observation the participants therefore displayed subtle but definite changes in their development which have to influence the content of an ECI programme.

### **5.2.3 THE DEVELOPMENT OF NEONATAL FEEDING SKILLS IN THE CONTEXT OF A KMC PROGRAMME**

In the KMC unit there was a clear progression in the participants from the most to the least assisted feeding methods which was consistent with the way the different feeding methods are introduced in the unit. The high percentage of participants receiving exclusive or partial breast feeding confirms the KMC unit's policy which encourages exclusive breast feeding (Van Rooyen et al., 2002).

Concomitant with an increase in unassisted feeding methods e.g. cup feeding or breast feeding over time, the participants displayed a decrease in the different sleep states during feeding times and an increase in the quiet alert state. This progression from more passive to active states corresponds with similar research findings which indicate that an increase in the alert states progressively increases the neonates' ability to feed with unassisted feeding methods (Arvedson & Brodsky, 2002; ASHA, 2004).

Readiness for oral feeding is also determined by the neonate's nutritive sucking skills and oral-motor feeding patterns (Hall, 2001). The study revealed that the participants' nutritive sucking skills progressed as they became older. Simultaneously, their oral-motor feeding patterns also increased over time. Therefore the pattern of development reflected an improved sequence of suck-swallow-and-breathing while oral-motor feeding patterns became increasingly functional in order to facilitate oral feeding from the most to least assisted method.

The participants' feeding development was documented in the absence of any oral sensorimotor intervention programme. Therefore a question arises regarding the speech-language therapist's involvement in the KMC unit in facilitating a quicker and effective transition from assisted to oral feeding methods. The lengthy periods of supplemental feeding of the participants in the NICU emphasises the need to minimize the number of days the participants receive supplemental feeding in the KMC unit. Feeding intervention in the KMC unit may contribute to early discharge as successful oral feeding is a criterion for discharge from the KMC unit (Van Rooyen et al., 2002). Successful functioning of

the oral sensorimotor mechanism is also important for later communicative development which is emphasised in a population at risk for later communication delays (Rossetti, 2001). Prolonged feeding difficulties in pre-term and low birth weight neonates were found to be a predictor of delayed communication development in the same infants at 12 months of age (Kritzinger et al., 1995).

#### **5.2.4 NEONATAL COMMUNICATION DEVELOPMENT**

It appeared that all the precursors of language development and cognitive development of the participants were already present during the in-turned state and became more complex during the coming-out and reciprocity states. During the in-turned state precursors of cognition (visual response to the environment and self-regulatory behaviour) were least observed while precursors of language content (response to sound and voices) were most observed.

When considering the behaviours categorized under the different precursors of language and cognitive development it was evident that the participants' sensory systems developed in a specific order. The tactile sensory systems appeared to develop first, followed by the auditory and visual sensory systems which are consistent with literature on the sequential development of the sensory systems (Gottlieb, 1971; Lotas, King & King, 2004). The extremely pre-term and/or very low birth weight neonate's development of the sensory systems, emphasize the need for the speech-language therapist to consider the sequential development of the sensory systems when providing guidelines for the gradual introduction of sensory experiences. It is especially important as over-stimulation of extremely pre-term neonates may increase their stress responses and consequently lead to weight loss (Rossetti, 2001). Therefore the need for individualized ECI programmes guided by the finding of graded sensory development is once again highlighted.

#### **5.2.5. MOTHER-NEONATE COMMUNICATION INTERACTION**

As the participants progressed through the different developmental states and demonstrated increased alert states their mothers became more responsive to their

behaviours. The emergence of responsive mother-neonate interaction over time is consistent with literature findings that KMC increases maternal sensitivity and responsiveness (Oghi et al., 2002). However, eight of the ten components of mother-neonate interaction that were measured did not reach optimal levels during the average 11 days in the KMC unit.

Since mothers and their infants stay for an average of 14 days in the KMC unit where the study was conducted (Van Rooyen et al., 2002) the quality of mother-neonate interaction is therefore an important area for intervention in the KMC unit. It is important for the speech-language therapist to view KMC units as early language learning environments for pre-term and/or low birth weight neonates and therefore implement ECI programmes to train mothers to stimulate their infants' communication and feeding development according to the infant's developmental state and level of sensory tolerance.

#### **5.2.6 THE ENVIRONMENT OF THE KMC UNIT**

The KMC unit was mostly characterized by natural light with no bright lights shining directly on the participants. The participants' surrounding environment was further characterized by moderate levels of noise. Both the lighting and noise levels in the KMC unit appeared to support the participants' neurobehavioural development which confirms KMC as a developmentally appropriate intervention strategy characterized by a reduction in detrimental environmental stimuli (Ludington-Hoe & Swinth, 1996; Young, 1997).

### **5.3 CRITICAL EVALUATION OF THE STUDY**

The study was executed by observing the behaviour and development of very low birth weight neonates and their mothers. This was a potentially vulnerable population as the participants could not make decisions for themselves and their mothers often had low educational levels (Mouton, 2001). Both the neonates and mothers were also from different cultural backgrounds than the researcher. These potential barriers of vulnerability, cultural diversity and low educational levels were overcome by the following: The researcher (1) gained informed consent from the participants' mothers

through the use of an English, Afrikaans or Sotho participant information leaflet (2) provided an unambiguous explanation of the purpose of the research (3) utilized an interpreter in cases where the mothers did not understand English or Afrikaans (4) had knowledge and experience of the mothers' values, norms, views and practices as the researcher had previously worked with mothers in the same KMC unit for a year.

Furthermore, an empirical descriptive research design in the form of a longitudinal survey was used to describe the participants' progress and development in the KMC unit over time. A structured data-collection method was selected since observation was the primary method of data collection. The observations were guided through the use of a data-collection protocol that was designed specifically for the purpose of this research project. The scoring of the data-collection protocol was subjective and therefore made it susceptible to bias. The following procedures were implemented to minimize the presence of bias: the researcher was familiar with most of the instruments and checklists used in the data-collection protocol as they were used in a previous research project (McInroy & Kritzinger, 2005); a pilot study was conducted to ensure the researcher's competence in the use of the data-collection protocol; the data-collection protocol was divided into eight sections to facilitate separate observation and recording of different developmental aspects; the participants were observed regularly and sufficient time was set aside for data collection to control observed changes due to a specific variable; the reliability of the individual observation sessions were increased by using a new data-collection protocol for every session to reduce any possible bias which could have been created by referring to previous data collections.

During the processing of the data it was discovered that certain of the values used for variables in the data-collection protocol lead to graphs which did not visually indicate progress over time i.e. "absent" behaviour was indicated by the value 2 and "present" behaviour by the value 1. Emergence of behaviour over time that was initially absent was therefore indicated by a downward trend in a graph. Therefore, to facilitate an upward trend in the graphs and consequently indicate progress over time, the following values of the variables were changed during data processing:



- “Absent (A)” behaviour was changed from 2 to 0.
- “Present (P)” behaviour was kept as a 1.
- “Organized behaviour” was changed from 0 to 1.
- “Disorganized behaviour” was changed from 1 or 2 to 0.

(See Appendix D)

The subjectivity of the data collection could have been reduced by using video recordings and a second assessor to complete the data-collection protocol but could have compromised the mothers’ spontaneity during observations. A possible solution to increase the reliability of the data collection could have been to utilize a second assessor for a certain percentage of the observations.

Although statistically the sample size for the study should have been 65 participants, only 25 participants were used (see 3.5.3). The sample size could be validated by the homogeneity of the sample due to specific selection criteria. Twenty five participants represented slightly more than 10% of the population in the KMC unit per year which was sufficient to control sampling error (Strydom & Venter, 2002). After completion of the pilot study and determination of the lengthy time frame for the data collection of 65 participants, the data-collection protocol could have been reduced and/or more time could have been allocated for the completion of the data collection. A smaller sample size, however made it possible to gain in-depth information about the developmental progress of the participants in the KMC unit.

As data collection often took place during care-giving routines such as diaper changing and bathing the data-collection protocol could have made provision to indicate in which situation or under which circumstances the behaviour of the participant was recorded. This differentiation would have made it easier to determine which behaviours were present during times of KMC and how the participants’ behaviours changed when they were removed from the KMC position to enable care-giving routines. A description of the change of the participants’ behaviour would have given the speech-language therapist an

indication of the training the mothers needed to ensure the participants were not over-stimulated during care-giving routines.

## **5.4 RECOMMENDATIONS FOR FURTHER RESEARCH**

As this study provided a description of neonatal developmental progress in a specific KMC unit further research could be done by describing the early development in a similar fashion in different KMC units to determine whether the results can be generalized.

High-risk neonatal development could also be described by a follow-up study starting in the setting prior to the KMC unit i.e. the NICU. Therefore neonatal development could be described starting at birth, progressing through the NICU and KMC unit until discharge from the hospital. At Kalafong hospital where the study was conducted, the neonates discharged from the KMC unit could be monitored in terms of development by utilizing the follow-up clinic for high-risk neonates. A follow-up study therefore could track the high-risk neonates' developmental progress.

A study tracking the long term developmental outcomes of high-risk neonates who received KMC could also be conducted to determine the effectiveness of KMC within the South African context. A comparative study could be conducted between a group of neonates who received KMC and a group who only received traditional NICU care in the SA context. Short term and long term longitudinal studies on the developmental progress and outcome of high-risk neonates exposed to KMC intervention in the South African context could be conducted.

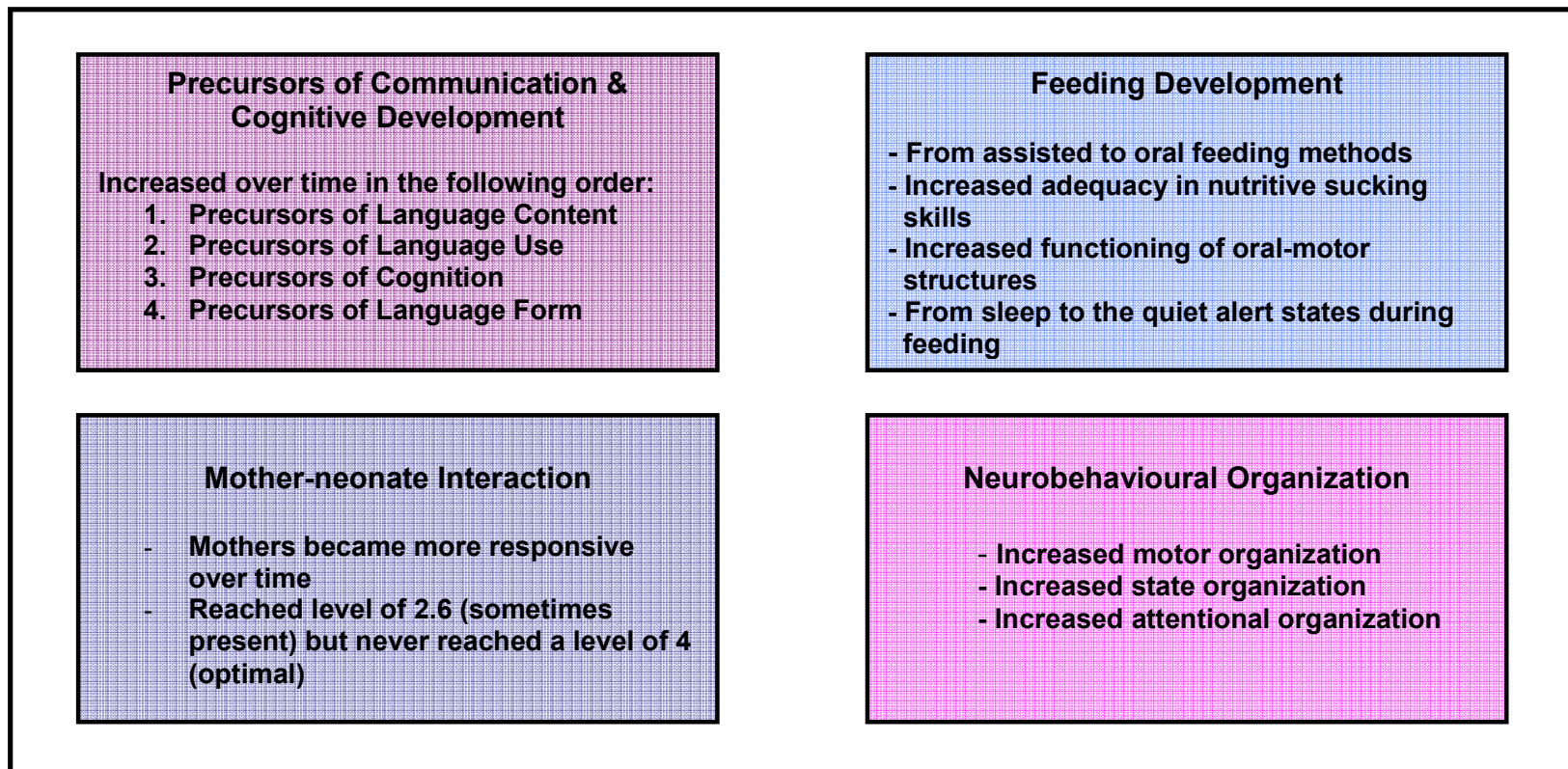
As this study provided evidence for the implementation of an ECI programme in a KMC unit further research could be done by implementing a specific ECI programme and comparing the neonates' and mothers' outcomes with a sample who was not exposed to the ECI programme. The data-collection protocol used to gather data for this study could

be refined and reduced into an assessment protocol to specifically guide speech-language therapists regarding the information needed in the individualized ECI programme.

## **5.5 CONCLUSION**

The main aim of this study was to contribute to the dearth of research on the earliest steps of communication and feeding development in high-risk neonates in the context of a KMC programme. Therefore, the characteristics of communication and feeding developmental steps, over time, were described against the background of other developmental subsystems. Specific emphasis was placed on communication and feeding development and mother-neonate interaction as this information should form the basis for an ECI and feeding programme in the context KMC. Figure 18 was compiled as a summary of the results obtained from this study.

### State and State Transitions: Progressed from the in-turned to the coming-out and reciprocity states



### State and State Transitions: Progressed from sleep states to the quiet alert state

Figure 15. Progression of the participants' development over an average of 11 days observation

According to Figure 18 the participants' demonstrated a significant progression in their development during 11 days of observation. This remarkable change and progress over a relatively short period of time is evidence of in-depth observation of the behavioural development of high-risk neonates. As demonstrated in Figure 18 it is evident that the participants developed from the in-turned state to the coming-out and reciprocity states as well as from sleep to quiet alert states.

The participants' progress from passive to active states therefore provided the framework for the development of every developmental area namely communication, feeding, mother-neonate interaction, and neurobehavioural organization. Within the time span of 11 days the participants were able to attend to their environment and they also developed the ability to regulate and organize their own behaviour in order to develop more complex communication, feeding and mother-neonate interaction skills.

KMC provides a context of early and sustained contact between the neonate and mother and therefore facilitates postnatal attachment during this sensitive period of development. During the neonate's stay in the KMC unit the mother is the primary caregiver and she is constantly available to train during a period when the neonate demonstrates significant developmental changes and progress (Kritzinger, 2004). As KMC was included in the draft guidelines for neonatal care in South Africa as an essential intervention method it is of paramount importance that speech-language therapists implement ECI in the context of KMC (Guidelines for Neonatal Care, 2004; Health for a Better Life, 2002/2003).

The KMC unit therefore provides an opportunity to start ECI as early as possible with the focus on preventing communication and feeding developmental delays and to improve the overall developmental outcome of high-risk neonates in South Africa. The speech-language therapist's involvement in KMC is further emphasized in the light of a shortage of practicing speech-language therapists in South Africa. It is therefore imperative that the prevention of communication delays, feeding difficulties and ECI assume priority (Arvedson & Brodsky, 2002; Moodley et al., 2000; Tuomi, 1994).

Since KMC is becoming an important intervention technique in the national health-care system in South Africa (Guidelines for Neonatal Care, 2004; Health for a Better Life, 2002/2003), the speech-language therapist therefore has the responsibility to facilitate best practice in the context of a KMC programme by providing appropriate ECI services with the aim of minimizing these neonates' risk of feeding difficulties and communication delays. The opportunity for ECI in the context of KMC needs to be utilized as developmental gains are greater when intervention starts as early as possible, resulting in more efficacious early intervention services (Louw, 1997; Moodley et al., 2000). Speech-language therapists implementing ECI as part of collaborative teamwork in the context of KMC, therefore aims "not only for the preservation of life, but the quality of the life that is saved" (Ziev, 1999: 33).

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## POST SCRIPT



*“You created my inmost being; you knit me together in my mother’s womb”*

*Psalm 139:13*

During this study, observing the development of fetuses in an extra-uterine environment, it once again became so clear that the Creator does not make mistakes and that each individual is “fearfully and wonderfully” made (Psalm 139: 14). Just like the high-risk neonates we all go through vulnerable times. Through personal experience and seeing these neonates survive within the loving care of their mothers’ hands these verses ring true: “And I give unto them eternal life, and they shall never perish, neither shall any man pluck them out my hands. My Father, which gave them me, is greater than all; and no man is able to pluck them out of my Father’s hand.” John 10: 28-29.

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## APPENDIX A

### INFORMED CONSENT FOR PARENTS

The purpose of the consent form is to give the investigator permission to observe me and my baby before, during and/or after feeding times. The investigator will observe us twice a week from the time that we are admitted to the Kangaroo Mother Care Unit until we are discharged. She will also record information from my baby's hospital file.

Alethea McInroy has provided me with a copy of the Patient Information Leaflet and Consent Form regarding the research project and she has fully explained to me the nature, risks, benefits and purpose of the study. She has given me the opportunity to ask any questions concerning the study and the information that is going to be obtained. It has been explained to me that I will be free to withdraw my baby from the study at any time, without any disadvantage to future care. I have understood everything that has been explained to me and I consent for me and my baby to participate in this study.

Parent/Guardian(s) Name \_\_\_\_\_ (Please print)

Parent/Guardian(s) Signature \_\_\_\_\_ Date \_\_\_\_\_

Subject's Name \_\_\_\_\_ (Please print)

Investigator's Name \_\_\_\_\_ (Please print)

Investigator's Signature \_\_\_\_\_ Date \_\_\_\_\_

Witness's Name \_\_\_\_\_ (Please print)

Witness's Signature \_\_\_\_\_ Date \_\_\_\_\_



## VERBAL INFORMED CONSENT

The purpose of the consent form is to give the investigator permission to observe me and my baby before, during and/or after feeding times. The investigator will observe us twice a week from the time that we are admitted to the Kangaroo Mother Care Unit until we are discharged. She will also record information from my baby's hospital file.

I, the undersigned, Alethea McInroy have read and have explained fully to the subject's mother, named ....., the patient information leaflet and informed consent, which has indicated the nature and purpose of the study in which I have asked the subject's mother to participate. The explanation I have given has mentioned both the possible risks and benefits of the study. The subject's mother indicated that she understands that she will be free to withdraw from the study at any time for any reason and without any disadvantage to future care.

I hereby certify that the subject's mother has agreed to participate in this trial.

Subject's Mother's Name \_\_\_\_\_ (Please print)

Investigator's Name \_\_\_\_\_ (Please print)

Investigator's Signature \_\_\_\_\_ Date \_\_\_\_\_

Witness's Name \_\_\_\_\_ (Please print)

Witness's Signature \_\_\_\_\_ Date \_\_\_\_\_

## **TSHEDIMOSETŠO LE TSEBIŠO YA BATSWADI**

Maikemisetšo a letlakala la tshedimosetšo ke go fa monyakisisi tokelo ya go lebelela nna le lesea laka pele, nakong le/goba morago ga nako ya phepo. Monyakisisi o tlo re lebelela gabedi bekeng go tloga nakong e re amogelwago phaphušing ya Kangaroo Mother Care go fihlela re lokolwa. Gape o tla ngwala tshedimosetšo ya ngwana wa gago e tswago mangwalong a bookelo.

Alethea McInroy omphile kgatišo ya letlakala la tshedimosetšo le tsebišo mabapi le thuto patlišišo, gape o tlhalositše ka botlalo ka ga tlhago, maitswaro, dikotsi, meputso le maikemisetšo a thuto. Ke bile le nako go botšiša dipotsišo ka ga thuto le ka tshedimosetšo etlo bonwago. Go tlhalositšwe gore nka ntša lesea laka thutong nako engwe le engwe kantle le go isenyeletša hlokomelong ya nako etlang. Ke kwišiša dilo ka moka tšeo ditlhalošitšwego gape ke fa nna le lesea laka tumelo ya go tsea karolo thutong ye.

Leina la motswadi/mohlokomedi \_\_\_\_\_ (*gatisa*)

Tshaeno ya motswadi/mohlokomedi \_\_\_\_\_ Letsatsi \_\_\_\_\_

Leina la ngwana/molwetsi \_\_\_\_\_ (*gatisa*)

Leina la monyakisisi \_\_\_\_\_ (*gatisa*)

Tshaeno ya monyakisisi \_\_\_\_\_ Letsatsi \_\_\_\_\_

Leina la paki \_\_\_\_\_ (*gatisa*)

Tshaeno ya paki \_\_\_\_\_ Letsatsi \_\_\_\_\_

## **APPENDIX B**

### **PARTICIPANT INFORMATION LEAFLET AND INFORMED CONSENT**

Study Title: Communication development of high-risk neonates from admission to discharge from a Kangaroo Mother Care Unit.

Investigator: Alethea McInroy

#### **NATURE OF THE STUDY**

A descriptive research design in the form of a survey to investigate the communication development of high-risk neonates from admission to discharge from a Kangaroo Mother Care (KMC) Unit.

#### **INTRODUCTION**

You are invited to volunteer for a research project. This information leaflet is to help you to decide if you would like to participate. Before you agree to take part in this study you should fully understand what is involved. If you have any questions, which are not fully explained in this leaflet, do not hesitate to ask the investigator. You should not agree to take part unless you are completely happy about all the procedures involved.

### **PURPOSE OF THE STUDY**

To describe how premature babies learn and grow while their mothers are doing KMC. If we know how the babies learn in the early stages of their development we may be able to tell mothers better how to help them to learn to talk.

It will also be determined if the different areas of the babies' growth have an influence on each other and whether there are things that influence the babies' growth.

### **PROCEDURES APPLIED TO COMPLETE THE STUDY**

When you are feeding your baby and for a short time afterwards I will watch how you and your baby act toward each other. You will not be expected to do anything other than looking after your baby. The behaviour I see between you and your baby will be written down. Information will also be written down from your baby's hospital file.

You and your baby will be watched twice a week from the time that you are admitted into the Kangaroo Mother Care Unit until you leave the Unit. Every time I watch you will take 30 to 60 minutes. I will not interfere with you and your baby and I will strictly follow measures for infection control.

### **WHAT ARE MY RIGHTS AS A PARTICIPANT IN THIS STUDY?**

Your participation in this study is entirely voluntary (you decide if you want to take part in the study or not) and you can refuse to participate or stop at any time without giving any reason. Your withdrawal will not affect your access to other medical care. The investigator retains the right to withdraw you from the study if it is considered to be in your best interest.

### **WHAT ARE THE RISKS AND BENEFITS INVOLVED WITH THIS STUDY?**

There will be no harm to you and your baby if you decide to participate in this study.

There are also no benefits for you and your baby if you decide to participate in the study. The information gained from this research will help speech-language therapists in the future to provide better services to babies and mothers in a Kangaroo Mother Care Unit.

### **CONFIDENTIALITY**

All information obtained during the course of this study is strictly confidential. You and your baby's names will not be written down anywhere. Information that may be reported in any publication will not include any information which will identify you or your baby.

### **SOURCE OF ADDITIONAL INFORMATION**

If you have any questions during the study, please do not hesitate to contact me. The telephone number is 082 6710 429, through which you can reach me.

---

Alethea McInroy  
Speech-Language Therapist and Audiologist  
& M Communication Pathology student

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Dr Alta Kritzinger / Senior lecturer and supervisor  
Department of Communication Pathology  
University of Pretoria

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Prof B Louw  
Head: Department of Communication Pathology  
University of Pretoria

## APPENDIX C

Date: 8 October 2004  
Dr H Dafel  
Medical superintendent  
Kalafong Hospital  
Private Bag x396  
Pretoria  
0002  
Copy to Prof M. Kruger  
Head: Department of Paediatrics, Kalafong Hospital.

Dear Dr Dafel

### **Consent to conduct a research study in the Kangaroo Mother Care Unit by a speech-language therapist and audiologist**

I herewith request consent to conduct a research study in the Kangaroo Mother Care (KMC) Unit of Kalafong Hospital for the partial completion of the degree M Communication Pathology. The aim of the research project is to describe the communication development of high-risk neonates from admission to discharge from the KMC Unit.

Sixty six subjects will be utilized, one for the pilot study and sixty five for the main study. All subjects will be observed twice weekly from admission to discharge from the KMC unit. Data-collection for both the pilot study and main study will include observations of the following:

- Observation of the neonate in the KMC unit during and before/after feeding times.
- Observation of mother-infant interaction.
- Collection of data from the neonate's and mother's medical files.

Consent has already been given by Dr Van Rooyen (head of the KMC unit) to conduct the research in the unit and informed consent will be obtained from the neonate's mother.

The researcher will not interfere with the care-giving routines in the unit and she will strictly follow the guidelines for infection control. Neonates will not be handled or disrupted from the KMC position.

Data collected will be used for the purpose of the researcher's thesis and the identities of the neonates and the mothers will not be revealed.

The opportunity to make use of your KMC unit will be appreciated.  
I trust that my request will be considered favourably.

Yours faithfully

---

Alethea McInroy  
Speech-Language Therapist and Audiologist  
and M Communication Pathology student

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Dr Alta Krtizinger / Senior lecturer and supervisor  
Department of Communication Pathology  
University of Pretoria

---

Prof B Louw  
Head: Department of Communication Pathology  
University of Pretoria

# APPENDIX D

## DATA COLLECTION PROTOCOL FOR HIGH RISK NEONATES

Data collection number
Subject number
Date
Date of Birth
Age

V1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	1
V2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	5
V3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	8
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	12
V4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	14
	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	18
V5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	20

### Section 1: Feeding assessment (Compiled from: Kritzinger, 1996; Jelm, 1990, JOGNN, 1994; Uys, 2000; Van Rooyen, 1999)

#### 1. Feeding method.

Breast feeding	<b>1</b>
Cup feeding	<b>2</b>
Spoon or syringe feeding	<b>3</b>
Bottle feeding	<b>4</b>
Nasogastric feeding	<b>5</b>
Gastrostomy feeding	<b>6</b>
Partial nasogastric, breast, bottle or cup feeding	<b>7</b>
Intravenous feeding	<b>8</b>

V6	<input type="text"/>	22
V7	<input type="text"/>	23

#### 2. Nutritional Information

**Use Scale**      **P**      =      **Present**      (1)  
                          **A**      =      **Absent**      (2)

	<b>P</b>	<b>A</b>
Breast milk	<b>1</b>	<b>2</b>
Pasteurized breast milk	<b>1</b>	<b>2</b>
Formula milk	<b>1</b>	<b>2</b>

V8	<input type="text"/>	24
V9	<input type="text"/>	25
V10	<input type="text"/>	26

#### 3. Main state of alertness during feeding

Deep / Quiet sleep	<b>1</b>
Active sleep	<b>2</b>
Drowsy	<b>3</b>
Quiet Alert	<b>4</b>
Active Awake / Fussy	<b>5</b>
Crying	<b>6</b>

V11	<input type="text"/>	27
-----	----------------------	----



4. Stage of development

Inturned stage	<b>1</b>
Coming-out stage	<b>2</b>
Reciprocity stage	<b>3</b>

V12  28

5. Physiological state

**Use Scale**      **P**      =      **Present**      (**1**)  
                         **A**      =      **Absent**      (**2**)

	<b>P</b>	<b>A</b>
Oxygen	<b>1</b>	<b>2</b>
Amino glycoside therapy	<b>1</b>	<b>2</b>

V13  29

V14  30

6. Stress cues during feeding

	<b>P</b>	<b>A</b>
Fatigue	<b>1</b>	<b>2</b>
Yawning	<b>1</b>	<b>2</b>
Sneezing	<b>1</b>	<b>2</b>
Hiccupping	<b>1</b>	<b>2</b>
Flared nostrils	<b>1</b>	<b>2</b>
Sweating	<b>1</b>	<b>2</b>
Crying / fussiness	<b>1</b>	<b>2</b>
Averting gaze	<b>1</b>	<b>2</b>
Fisting of hands	<b>1</b>	<b>2</b>
Falling asleep	<b>1</b>	<b>2</b>
Coughing	<b>1</b>	<b>2</b>
Choking	<b>1</b>	<b>2</b>
Vomiting	<b>1</b>	<b>2</b>
Noisy breathing	<b>1</b>	<b>2</b>
Colour change	<b>1</b>	<b>2</b>
Chest retraction	<b>1</b>	<b>2</b>
Stridor	<b>1</b>	<b>2</b>
Actively refusing nipple	<b>1</b>	<b>2</b>

V15  31

V16  32

V17  33

V18  34

V19  35

V20  36

V21  37

V22  38

V23  39

V24  40

V25  41

V26  42

V27  43

V28  44

V29  45

V30  46

V31  47

V32  48

7. General postural control

The overall muscle tone is:

Normal	<b>1</b>
Low	<b>2</b>
High	<b>3</b>
Fluctuating	<b>4</b>

V33  49

8. Nutritive sucking

**Use Scale**      *P*    =    *Present*    (1)  
                         *A*    =    *Absent*      (2)

	<b>P</b>	<b>A</b>
Rooting reflex	<b>1</b>	<b>2</b>
Suck, swallow and breathing sequence	<b>1</b>	<b>2</b>
Pause in suck, swallow and breathing sequence	<b>1</b>	<b>2</b>
Strength of suck (adequate or weak)	<b>1</b>	<b>2</b>

V34  50  
V35  51  
V36  52  
V37  53

9. Breastfeeding

**Latching**

Too sleepy or reluctant, no latching on achieved	<b>0</b>
Repeated attempts. Holds nipple in mouth. Requires stimulation to suck	<b>1</b>
Grasps breast, tongue down, lips flanged, rhythmic sucking	<b>2</b>

V38  54

**Positioning**

Full assistance (staff holds infant at mother's breast)	<b>0</b>
Minimal assistance (i.e. elevate head of bed, place pillows for support)	<b>1</b>
No assistance from staff, mother able to position/hold infant	<b>2</b>

V39  55

10. Cup feeding

**Use Scale**      *P*    =    *Present*    (1)  
                         *A*    =    *Absent*      (2)

	<b>P</b>	<b>A</b>
Positioning, wrapped securely, held upright on lap	<b>1</b>	<b>2</b>
Cup appropriately half full	<b>1</b>	<b>2</b>
Rim against upper lip	<b>1</b>	<b>2</b>
Infant sucks milk from cup	<b>1</b>	<b>2</b>

V40  56  
V41  57  
V42  58  
V43  59

11. Nonnutritive Sucking

**Use Scale**      *P*    =    *Present*    (1)  
                         *A*    =    *Absent*      (2)

	<b>P</b>	<b>A</b>
Lip closure on finger / nipple	<b>1</b>	<b>2</b>

V44  60

## 12. Oral-motor / Feeding patterns

<b>Use Scale</b>	<b>N</b>	=	<b>Normal function</b>	<b>(0)</b>
	<b>Q</b>	=	<b>Questionable dysfunction</b>	<b>(1)</b>
	<b>&lt;25</b>	=	<b>Less than 25%</b>	<b>(2)</b>
	<b>&lt;50</b>	=	<b>25% - 50%</b>	<b>(3)</b>
	<b>&lt;75</b>	=	<b>50% - 75%</b>	<b>(4)</b>
	<b>&gt;75</b>	=	<b>More than 75%</b>	<b>(5)</b>

	N	Q	<25	<50	<75	>75
Lip / cheek	0	1	2	3	4	5
Tongue	0	1	2	3	4	5
Jaw	0	1	2	3	4	5

V45  61  
 V46  62  
 V47  63

## 13. Current weight

--

V48     64

## 14. Infant's weight gain per day

0 – 10 g	0
11 – 20 g	1
21 – 30 g	2

V49  68

**Section 2: Developmental assessment (Compiled from: Willemse, 2003)**

## 15. Main state during assessment

**Deep / Quiet sleep**

Regular respiration, no activity, no eye movements	1
--	---

V50  69

**Drowsy**

Eyes may be open, but dull / heavy-lidded, eyelid fluttering, movement usually smooth, unavailable "look"	2
---	---

**Active, Awake / Fussy**

Eyes open, irregular respiration, considerable motor activity, brief fussy vocalizations	3
--	---

**Active sleep**

Irregular respiration, low activity level, eye opening may occur brief intervals, rapid eye movement seen under closed eyelids	4
--	---

**Quiet Alert**

Eyes open and bright, regular respiration, minimal activity, focus attention on source of stimulation auditory or visual	5
--	---

**Crying**

Intense crying, difficult to break through with stimulation, motor activity high, facial cry (ventilated infants)	6
---	---

**16. Behavioural assessment – Motor organization or disorganization**

**Use Scale**            **O**    =    **Organization**        **(0)**  
                               **D**    =    **Disorganization**      **(1 or 2)**

Muscle tone

Normal	<b>0</b>
High	<b>1</b>
Low	<b>2</b>

V51  70

Movement

Smooth	<b>0</b>
Frantic diffuse activity	<b>1</b>
Flacid with minimal activity	<b>2</b>

V52  71

Posture

Relaxed	<b>0</b>
Motoric flacidity	<b>1</b>
Flacidity of trunk, extremities and / or face	<b>2</b>

V53  72

Flexion

Maintain flexion with support or minimal support	<b>0</b>
Hyperextension of trunk and extremities	<b>1</b>
Hyperflexion of trunk and extremities	<b>2</b>

V54  73

Sucking

Strong and rhythmical	<b>0</b>
Poor, weak, uncoordinated	<b>1</b>
No attempt at sucking	<b>2</b>

V55  74

State

Calm and restful	<b>0</b>
Squirming	<b>1</b>
Unsettled	<b>2</b>

V56  75

17. Behavioural assessment – States well organized or disorganized

**Use Scale**            **O**    =    **Organization**        (**0**)  
                                 **D**    =    **Disorganization**      (**1 or 2**)

States present

Clearly defined states	<b>0</b>	V57	<input type="text"/>	76
Diffuse sleep states	<b>1</b>			

State changes

Smooth	<b>0</b>	V58	<input type="text"/>	77
Frequent abrupt changes	<b>1</b>			

Range of states

Full range of states	<b>0</b>	V59	<input type="text"/>	78
Limited range of states	<b>1</b>			

Deep sleep state

Periods of deep sleep	<b>0</b>	V60	<input type="text"/>	79
Rarely in deep sleep	<b>1</b>			

Ability to be consoled

Can be consoled	<b>0</b>	V61	<input type="text"/>	80
Inconsolable	<b>1</b>			

Quiet alert state

Sustained quiet alert state	<b>0</b>	V62	<input type="text"/>	81
Not sustaining	<b>1</b>			
Coming into quiet alert	<b>2</b>			

Cry

Robust cry	<b>0</b>	V63	<input type="text"/>	82
Weak / irritable cry	<b>1</b>			
Inappropriately silent	<b>2</b>			

**18. Behavioural assessment – Attention / Interaction subsystem or disorganization**

**Use Scale**      **O** = **Organization**      (**0**)  
                          **D** = **Disorganization**      (**1 or 2**)

Alertness

Bright focused alert	<b>0</b>
Dulled alertness	<b>1</b>
Hyper-alert	<b>2</b>

V64  83

Eye movements

Sustained attention / eye contact / quietly looking around	<b>0</b>
Gaze aversion / staring / frowning	<b>1</b>

V65  84

Ability to habituate

Ignores repetitive stimulation	<b>0</b>
Inability to habituate	<b>1</b>

V66  85

Stimulation

Able to handle more than one stimulation at a time	<b>0</b>
Easily over-stimulated	<b>1</b>

V67  86

Physiological stability

Maintains physiological stability during interaction	<b>0</b>
Displays physiological instability during interaction	<b>1</b>

V68  87

**19. Behavioural assessment – Self-regulation or disorganization**

**Use Scale**      **O** = **Organization**      (**0**)  
                          **D** = **Disorganization**      (**1 or 2**)

Organization

Remains organized in challenging situations	<b>0</b>
Disorganized in one or all of the subsystems	<b>1</b>

V69  88

Self-regulation

Attempts at self-regulation	<b>0</b>
Lacks self-regulation	<b>1</b>

V70  89

**20. Behavioural assessment – Self-regulation behaviours observed**

**Use Scale**            *P*    =    *Present*        (1)  
                                 *A*    =    *Absent*         (2)

	<b>P</b>	<b>A</b>		
Hands-on-face	<b>1</b>	<b>2</b>	V71	<input type="checkbox"/> 90
Hand clasp foot clasp	<b>1</b>	<b>2</b>	V72	<input type="checkbox"/> 91
Hand-to-mouth / hand / face	<b>1</b>	<b>2</b>	V73	<input type="checkbox"/> 92
Grasping	<b>1</b>	<b>2</b>	V74	<input type="checkbox"/> 93
Leg / foot brace	<b>1</b>	<b>2</b>	V75	<input type="checkbox"/> 94
Suck search	<b>1</b>	<b>2</b>	V76	<input type="checkbox"/> 95
Sucking	<b>1</b>	<b>2</b>	V77	<input type="checkbox"/> 96
Hand holding	<b>1</b>	<b>2</b>	V78	<input type="checkbox"/> 97

**21. Behavioural assessment – Avoidance behaviours observed**

**Use Scale**            *P*    =    *Present*        (1)  
                                 *A*    =    *Absent*         (2)

	<b>P</b>	<b>A</b>		
Finger splaying	<b>1</b>	<b>2</b>	V79	<input type="checkbox"/> 98
Toe splaying	<b>1</b>	<b>2</b>	V80	<input type="checkbox"/> 99
Airplane	<b>1</b>	<b>2</b>	V81	<input type="checkbox"/> 100
Sitting on air	<b>1</b>	<b>2</b>	V82	<input type="checkbox"/> 101
High guard arm action	<b>1</b>	<b>2</b>	V83	<input type="checkbox"/> 102
Fetal tuck	<b>1</b>	<b>2</b>	V84	<input type="checkbox"/> 103
Fisting	<b>1</b>	<b>2</b>	V85	<input type="checkbox"/> 104
Tongue extension	<b>1</b>	<b>2</b>	V86	<input type="checkbox"/> 105

**Section 3: Environment (Compiled from: Swanepoel, 2000; Van Rooyen, 1999).**

**22. Lighting**

Bright light directly on infant	<b>1</b>	V87	<input type="checkbox"/> 106
Bright light in infant's environment	<b>2</b>		
Dim lights except for care giving routines	<b>3</b>		

**23. Noise**

High levels of noise close to infant	<b>1</b>	V88	<input type="checkbox"/> 107
Moderate noise close to infant	<b>2</b>		
Environment mainly quiet	<b>3</b>		

**24. Types of noise**

**Use Scale**      *P*      =      *Present*      (1)  
                         *A*      =      *Absent*      (2)

	<b>P</b>	<b>A</b>		
Equipment	<b>1</b>	<b>2</b>	V89	<input type="text"/> 108
Voices	<b>1</b>	<b>2</b>	V90	<input type="text"/> 109
Cleaning equipment	<b>1</b>	<b>2</b>	V91	<input type="text"/> 110
Human movement and handling objects	<b>1</b>	<b>2</b>	V92	<input type="text"/> 111

**25. Positioning**

Infant on back with extended extremities	<b>1</b>	V93	<input type="text"/> 112
Infant to a degree in flexion	<b>2</b>		
Infant in middle position with hands close to face	<b>3</b>		

**26. Support**

Inadequate support and boundaries provided for infant	<b>1</b>	V94	<input type="text"/> 113
Limited support and boundaries provided for infant	<b>2</b>		
Adequate support and boundaries provided for infant	<b>3</b>		

**27. Confidence in handling infant i.e. feeding, bathing, changing**

Always needs assistance	<b>0</b>	V95	<input type="text"/> 114
Occasionally needs assistance	<b>1</b>		
No assistance needed	<b>2</b>		

**Section 4: Neonatal communication skills (Compiled from: Kritzinger, 2002).**

**28. Precursors to language use**

**Use Scale**      *P*      =      *Present*      (1)  
                         *A*      =      *Absent*      (2)

	<b>P</b>	<b>A</b>		
Noticeable reaction to a person	<b>1</b>	<b>2</b>	V96	<input type="text"/> 115
Makes momentary eye contact	<b>1</b>	<b>2</b>	V97	<input type="text"/> 116
Imitation of person: stretch eyes, open mouth, protrude tongue	<b>1</b>	<b>2</b>	V98	<input type="text"/> 117
Synchronized interaction with person	<b>1</b>	<b>2</b>	V99	<input type="text"/> 118
Stops crying when picked up	<b>1</b>	<b>2</b>	V100	<input type="text"/> 119
Reflexive smile	<b>1</b>	<b>2</b>	V101	<input type="text"/> 120
Accepts cuddling	<b>1</b>	<b>2</b>	V102	<input type="text"/> 121



**29.** Precursors to language content. Reflexive response when exposed to sound. High frequency noise maker / Stimulus from environment

**Use Scale**      **P**    =    **Present**      (1)  
                         **A**    =    **Absent**      (2)

	<b>P</b>	<b>A</b>		
Limbs move	<b>1</b>	<b>2</b>	V103	<input type="checkbox"/> 122
Body moves	<b>1</b>	<b>2</b>	V104	<input type="checkbox"/> 123
Eyelids move	<b>1</b>	<b>2</b>	V105	<input type="checkbox"/> 124
Breathing tempo increases	<b>1</b>	<b>2</b>	V106	<input type="checkbox"/> 125
Eyes move	<b>1</b>	<b>2</b>	V107	<input type="checkbox"/> 126

**30.** Precursors to language content. Reflexive response when exposed to sound.

	<b>P</b>	<b>A</b>		
Preference for mother's voice	<b>1</b>	<b>2</b>	V108	<input type="checkbox"/> 127
Calmed by person's voice	<b>1</b>	<b>2</b>	V109	<input type="checkbox"/> 128
Listens to speaker	<b>1</b>	<b>2</b>	V110	<input type="checkbox"/> 129
Gets neonate's attention through vocalization	<b>1</b>	<b>2</b>	V111	<input type="checkbox"/> 130

**31.** Precursors to language form.

	<b>P</b>	<b>A</b>		
Birth cry	<b>1</b>	<b>2</b>	V112	<input type="checkbox"/> 131
Cries often	<b>1</b>	<b>2</b>	V113	<input type="checkbox"/> 132
Undifferentiated cry	<b>1</b>	<b>2</b>	V114	<input type="checkbox"/> 133
Differentiated cry	<b>1</b>	<b>2</b>	V115	<input type="checkbox"/> 134
Cry in reaction to other's cry	<b>1</b>	<b>2</b>	V116	<input type="checkbox"/> 135
Sounds of discomfort	<b>1</b>	<b>2</b>	V117	<input type="checkbox"/> 136
Negative suck, swallow, yawn, hiccup, winds, snore, sigh, sneeze, cough	<b>1</b>	<b>2</b>	V118	<input type="checkbox"/> 137
Non-reflexive vocalizations	<b>1</b>	<b>2</b>	V119	<input type="checkbox"/> 138
Vocalizes in reaction to speech and touch	<b>1</b>	<b>2</b>	V120	<input type="checkbox"/> 139

**32.** Precursors to cognition.

	<b>P</b>	<b>A</b>		
Gives momentary attention to red ring	<b>1</b>	<b>2</b>	V121	<input type="checkbox"/> 140
Looks around	<b>1</b>	<b>2</b>	V122	<input type="checkbox"/> 141
Protective reaction with cloth over face	<b>1</b>	<b>2</b>	V123	<input type="checkbox"/> 142
Adaptive behaviour after repetitive exposure to stimulus	<b>1</b>	<b>2</b>	V124	<input type="checkbox"/> 143
Self-regulating behaviour: Hand to mouth	<b>1</b>	<b>2</b>	V125	<input type="checkbox"/> 144
Self-regulating behaviour: Sucks hand	<b>1</b>	<b>2</b>	V126	<input type="checkbox"/> 145
Self-regulating behaviour: Uses visual and auditory stimuli from environment	<b>1</b>	<b>2</b>	V127	<input type="checkbox"/> 146

**Section 5: Parent-child interaction (Klein & Briggs, 1986).**

33. Read each statement below and respond by using the following scale:

**Use Scale**

<b>R</b>	=	<b>Rarely / Never</b>	<b>(1)</b>
<b>S</b>	=	<b>Sometimes</b>	<b>(2)</b>
<b>Of</b>	=	<b>Often</b>	<b>(3)</b>
<b>Op</b>	=	<b>Optimal</b>	<b>(4)</b>

	R	S	Of	Op		
Provides appropriate tactile and kinesthetic stimulation	1	2	3	4	V128	<input type="text"/> 147
Display of pleasure	1	2	3	4	V129	<input type="text"/> 148
Responds to child's distress	1	2	3	4	V130	<input type="text"/> 149
Positions self and infant so eye-to-eye contact is possible	1	2	3	4	V131	<input type="text"/> 150
Smiles contingently at infant	1	2	3	4	V132	<input type="text"/> 151
Varies prosodic features	1	2	3	4	V133	<input type="text"/> 152
Encourages conversation	1	2	3	4	V134	<input type="text"/> 153
Responds contingently to infant's behaviour	1	2	3	4	V135	<input type="text"/> 154
Modifies interaction in response to negative cues from infant	1	2	3	4	V136	<input type="text"/> 155
Use communication to teach language and concepts	1	2	3	4	V137	<input type="text"/> 156

**Section 6: Risk assessment (Compiled from: Kritzinger, 1994, revised 2003)**

**Prenatal history**

34. Age of mother. (18 – 37 years old)

	V138	<input type="text"/>	<input type="text"/>	157
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35. Maternal education. (Specify)

	V139	<input type="text"/>	<input type="text"/>	159
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36. Birth order of infant. (Highest mortality for 1<sup>st</sup> and 3<sup>rd</sup> born children)

	V140	<input type="text"/>	161
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**37.** Duration of pregnancy. (38 – 41 weeks)

V141   162

**38.** Reason for premature birth

V142   164

**Perinatal history**

**39.** Birth weight. (3200g – 3800 g)

V143     166

**40.** *Apgar* score

V144   170

**41.** Size (Gestation age = Birth weight)

**Use Scale**            **Y**    =    **Yes**    (**1**)  
                                 **N**    =    **No**      (**2**)

	<b>Y</b>	<b>N</b>
Small for gestational age/Intrauterine growth retardation evident	<b>1</b>	<b>2</b>

V145  172

**42.** Oxygen received and duration

V146   173

**43. Symptoms etc.**

**Use Scale**            **Y**    =    **Yes**    (**1**)  
                               **N**    =    **No**     (**2**)

	<b>Y</b>	<b>N</b>		
Respiratory distress syndrome	<b>1</b>	<b>2</b>	V147	<input type="text"/> 175
Septicemia	<b>1</b>	<b>2</b>	V148	<input type="text"/> 176
Amino glycoside therapy <b>duration</b>			V149	<input type="text"/> <input type="text"/> 177
Hyperbilirubinemia photo therapy <b>duration</b>			V150	<input type="text"/> <input type="text"/> 179
<b>Number</b> of days before bottle fed/ breast fed			V151	<input type="text"/> <input type="text"/> 181
<b>Number</b> of days in NICU and/or High Care			V152	<input type="text"/> <input type="text"/> 183

**Other conditions:**

Condition 1:	V153	<input type="text"/> <input type="text"/>	185
Condition 2:	V154	<input type="text"/> <input type="text"/>	187
Condition 3:	V155	<input type="text"/> <input type="text"/>	189