

CHAPTER 1

ORIENTATION AND STATEMENT OF PROBLEM

Aim: To provide an overview of the problem related to the evaluation of feeding skills in premature infants, in order to serve as a rationale for the study. A solution is proposed, important concepts are defined and the organisation of the chapters is presented.

1.1 INTRODUCTION

Although early intervention is a relatively new discipline, it is a well-recognised field today. Early intervention is usually provided to infants from 0-3 years of age with or at-risk for developmental problems. The United States of America recognises the importance of early intervention with appropriate legislation. The general belief is that the sooner the intervention can be provided, the better the outcome will be (Rossetti, 1998). Early intervention in the Neonatal Intensive Care Unit (NICU) was found not only to be effective, but the developmental outcome of the premature infants also improved significantly due to intervention (Hyde & Jonkey, 1994).

There are certain factors that may place an infant at risk for developmental delays and/or difficulties. These factors, whether they are biological, established or of environmental origin, can influence the infant any time from conception up to well after birth. Due to improved medical technology, currently more infants with biological risk factors survive (Rossetti, 1996; Widerstrom, Mowder & Sandall, 1997). Once the risk factors are identified, comprehensive assessment of the developmental areas can be done and appropriate intervention can be implemented to prevent or minimise any developmental delays which could have

resulted from these risk factors (McCarton, Wallace & Bennet, 1995; Rossetti, 1986, 1998; Sweeney, 1985; Widerstrom et al., 1997)

Premature infants form a recognised high-risk group who require early intervention services. The number of infants in this group is also on the increase, due to improved and more sophisticated medical technology and procedures (Bazyk, 1990; Rossetti, 1986; Oehler, Thompson & Gustafsen, 1996). The survival rate of premature infants has increased considerably in the last decade. This is especially true for the number of infants born between 23 and 25 weeks gestational age (Lau & Hurst, 1999). In South Africa the same phenomenon is experienced. The percentage of infants born with low birth weights, who survive, has increased from 2% (in earlier years) to 18.8 % in 1998 and 15.8 % in 1999 (De Witt, Naudè & Pistorius, 2000). This is not only as a result of improved medical care but can also be attributed to the implementation of the new national health policy, which attempts to provide free medical care for all infants and young children (under the age of six years) in state hospitals. Health care professionals working in neonatal intensive care units, accordingly have a bigger responsibility to manage this increased number of patients effectively.

1. 2 STATEMENT OF PROBLEM

The preterm infant is at risk for many problems, medically as well as developmentally (Bennett, 1995; Jacobson & Shubat, 1991; McCarton et al., 1995). One of the first and more serious problems experienced by preterm and low-birthweight infants, are **feeding problems**. Feeding difficulties make up a major proportion of the problems that arise from prematurity (Bu'Lock, Woolridge & Baum, 1990). Oral feeding of these infants has therefore become a critical concern (Lau & Hurst, 1999). The medical complications that these infants may suffer may also contribute to further feeding problems (Arvedson & Brodsky, 1993; Creger, 1995; Vergara, 1993; Wolf & Glass, 1991). On the other hand,

feeding and swallowing problems can complicate medical management, resulting in prolonged hospitalisation (Comrie & Helm, 1997). There has recently been a tendency to discharge infants earlier, so that the need to intervene and to equip parents for home care management has increased accordingly (Alper & Manno, 1996). Feeding problems do not only imply sucking and swallowing difficulties, but also include aspects such as the cardio-respiratory status (pneumonia, oxygen desaturation, apnea and bradycardia), neuromotor maturity and the state and behaviour of the infant (Lau & Hurst, 1999; Vergara, 1993). Due to their immature nervous systems, premature and sick infants (NICU candidates) are particularly vulnerable to adverse conditions and stress. Inappropriate intervention in the NICU can have life-threatening consequences and traditional therapies may be harmful. The provision of safe and effective therapy to these fragile patients, who require intensive care, implies an advanced level of competency and judgement – beyond that of standard training (Hyde & Jonkey, 1994). Jolley, McClelland, & Mosesso-Rousseau, (1995) also state that the rising number of surviving infants in the NICU created the need for a more detailed assessment of the feeding and swallowing skills of these infants. Effective, accountable therapy in the NICU can only be implemented when appropriate, comprehensive assessment of the infant has taken place. This implies that specially designed assessment procedures are needed to assess the premature infant as a whole, as well as to determine specific areas of need.

Team members involved with the treatment of the NICU patient, including the speech–language pathologist/feeding specialist, should undergo specialised training, study and practice, which includes a clear understanding of neonatal medical conditions and treatment procedures to ensure effective accountable service delivery (Hunter, Mullen & Dallas, 1994, Hyde & Jonkey, 1994). The composition of professionals in the team varies depending on the setting. Infants in neonatal intensive care units, have complicated problems and the professionals who have to address their feeding problems, work in a complex setting. It is therefore important that the professionals and the parents in the NICU setting should work together as a team. The team involved in the management of the

infant in the NICU should include as basic members: the family, nurses (who are the primary feeders) and physicians (e.g. neonatologist, who is the primary physician). Other members who need to be included are ophthalmologists, radiologists, gastro-enterologists, paediatric surgeons and paediatric orthopaedic surgeons, as well as developmental specialists. The last-mentioned group may include any or all of the following: speech-language therapists, occupational therapists, physical therapists, social workers, psychologists and nutritionists (Comrie & Helm, 1997; Lau & Hurst, 1999; Lefton-Greif & Arvedson 1997; Sheahan & Brockway, 1994).

Although some experts like Lau & Hurst (1999) support an interdisciplinary approach, Lefton-Greif & Arvedson (1997) recommend a transdisciplinary approach in the NICU, primarily because of concerns regarding the infant's fragile medical status. Which kind of team approach to follow in the NICU is a complex decision. Regarding the feeding specialist and the primary feeder, the infant can be managed in a transdisciplinary fashion. On the other hand, in terms of medical care, the physicians have to be in control and it is clear that the feeding specialist cannot work in a transdisciplinary capacity. An inter- and even multidisciplinary approach may therefore be more appropriate in the NICU. The paediatric swallowing team comprises several disciplines that share knowledge and interest in overlapping functions that involve multiple anatomic and physiologic systems.

The feeding specialist in the NICU assists in the diagnoses of feeding and swallowing problems, and works with the parents and nurses to establish appropriate feeding guidelines. The infant's status is monitored for improvement in, or regression of, oral feeding skills. The feeding/swallowing specialist usually has professional credentials in speech-language therapy or occupational therapy (Lefton-Greif & Arvedson, 1997). The speech-language therapist plays an active role in the NICU (Alper & Manno, 1996). On the one hand, he/she concentrates on **early communication aspects** and, on the other hand, functions as **feeding specialist**. The purpose of early communication is to tune in to the infants and to provide the appropriate stimulation at the right time (Billeaud, 1993). As feeding

specialist, the speech-language therapist's role is multifaceted and may include the following functions:

- Performing of oral stimulation (Dunn, Van Kleeck & Rossetti, 1993; Sweeney, 1985),
- Reducing tactile defensiveness in and around the infant's mouth (Morris, 1989; Vergara, 1993),
- Providing information to all the team members on the benefits of non-nutritional sucking for infants who are being tubefed (Creger, 1995; Dunn et al., 1993; Morris, 1989; Premji & Paes, 2000; Sheahan & Brockway, 1994),
- Recognising the infant's stress signals (Hussey, 1988)
- Reducing interactional demands on the infant by controlling the NICU environment during feeding (Rossetti, 1998).
- Being responsible for the safe and efficient transfer of non-oral feeding to oral feeding in the preterm infant (Comrie & Helm, 1997; Creger, 1993; Harris, 1986; Mandich & Ritchie, 1996). This implies that the infant must be able to feed safely by breast, bottle or cup. Comprehensive evaluation of the premature infant's state, behaviour, oral-motor and feeding skills is needed to plan safe and accountable intervention.

Cupfeeding, instead of bottle-feeding, of premature infants as an interim method of feeding, until the infant can feed from the breast, is advised by the World Health Organization (WHO, 1989). According to the WHO, breastfeeding is to be promoted in South Africa (as for all infants born in developing countries), because breast milk is more beneficial to the infant than formula milk, it is cheaper and no sterilisation facilities or practices are needed. Bottle-feeding in many rural communities may lead to many problems which may adversely affect the health and nutritional status of infants, such as access to portable, safe water, maintenance of proper sanitation and adequate literacy to prepare the infant

formula according to prescribed guidelines (Olayinka, Oni, Mbajorgu, 2000). This results in poor weight gain and the infants become undernourished which is highly undesirable in this period of rapid brain growth. Furthermore, unsterilised utensils can cause gastro-intestinal infections, which can be life threatening to the young infant. Bottle-feeding in the hospital should be discouraged to avoid nipple confusion in the infant and to avoid the infant becoming accustomed to the shape of the artificial teat and the taste of formula milk and thereafter refusing the breast. Hospitals following the principles advocated by the WHO's and the United Nations Children's Fund's "ten steps to successful breastfeeding", have been awarded the title of "baby friendly hospital" since the early 1990s (Lau & Hurst, 1999). In such hospitals expressed breast milk is requested from mothers of small infants soon after birth. In the local NICU the breast milk is presented with a cup. Boo, Puah & Lye (2000) found that one of the three factors which were significantly associated with the survival of extremely low birthweight infants was the used of expressed breast milk to these infants.

Recently, the issue of whether HIV positive mothers should breastfeed is debated. A study in Zimbabwe found that infants who were exclusively breastfed were at highest risk of mother to child transmission (MTCT) of HIV-1, within the first 3 months. They found breastfed infants four times more at risk of MTCT of HIV-1, than formula-only fed infants (Olayinka et al., 2000). A study conducted in Durban, South Africa, found that exclusive breastfeeding for 6 months reduced the risk of HIV transmission by 44%, compared with mixed feeding (Bobat, 2000). The general consensus though, is that HIV infected mothers should be advised about the risks and benefits of breast feeding for infants, in order to make an informed choice to breastfeed or not (Bobat, 2000; Olayinka et al., 2000). Should their choice be to breastfeed, the breastfeeding should be made as safe as possible and all encouragement to do so exclusively for 6 months should be given.

The question as to why so much emphasis is placed on effective oral feeding in infants, arises. *Firstly*, the sufficient growth of infants is primarily a function of

adequate nutritional intake. The ability to take in that which is needed for adequate weight gain, is the first step in a feeding programme. Most hospitals use a specific weight as a discharge criterion (Comrie & Helm, 1997). Adequate nutritional intake depends on the infant's ability to feed by bottle, cup or breast safely and successfully. It is therefore important to help the preterm infant to transfer to successful oral feeding as soon as possible, so that he/she can be discharged from hospital. The sooner the infant can be discharged, the sooner the parent-infant relationship can be built in normal domestic circumstances. It can also benefit the parents or state hospitals financially to have the infant discharged a few days earlier (Bernbaum & Hoffman-Williamson, 1991; Gaebler & Hanzlik, 1995; Mattes et al., 1994).

Secondly, food is a very important aspect of people's lives. Feeding is not only life-sustaining but has psychological, cultural and symbolic significance. We entertain, celebrate and "treat" each other with food. When a mother is unable to feed her baby, it elicits feelings of concern, anxiety, frustration, resentment, anger and despair. Feelings of inadequacy, incompetence and being worthless as a mother and woman, are common in mothers of infants with feeding problems (Jaffe, 1989; Ramsey, Gisel & Bounty, 1993; Ramsey & Gisel, 1996; Rosenthal, Sheppard & Lotze, 1995). Ramsey & Gisel (1996) also found that early feeding impairment might trigger maladaptive interactional patterns between infants and their mothers/caregivers. Jaffe (1989) and Rosenthal et al. (1995) agree that feeding problems can negatively influence bonding and communication between mother and infant. Thus, it is of the utmost importance to intervene as soon as possible when infants experience feeding problems. It is clear that feeding therapy is an important aspect of early intervention. Accountable intervention should be preceded by comprehensive evaluation.

Comrie & Helm (1997) state that there is an increasing need to identify and evaluate feeding and swallowing difficulties in the NICU, to provide intervention strategies and to prepare families or caregivers for discharge. Jolley et al., (1995) suggest that a more detailed, thus a comprehensive feeding assessment of

premature infants' feeding skills is needed to enable the feeding specialist to plan **appropriate, effective** and **accountable** intervention. A thorough understanding of all aspects of sucking, swallowing and breathing patterns of the premature infant, the general characteristics and medical condition of premature infants and a comprehensive evaluation tool is needed for the appropriate management of feeding difficulties of these premature infants (Vergara, 1993). Cherney (1994) and Rosenthal et al. (1995) emphasize the fact that assessment of all phases of swallowing should be included when evaluating infants' feeding abilities.

Researchers from many disciplines (DeMonterice, Meier, Engstrom, Crichton & Mangurten, 1992) have studied sucking in full-term and preterm infants. Although various aspects of sucking, swallowing and breathing patterns of the full-term infant during bottle- and breastfeeding have been described in the literature, limited information is available on the sucking, swallowing and breathing patterns of the premature infant during bottle-, breast- and cupfeeding (Shivpuri, Martin, Carlo & Fanaroff, 1983; Rosen, Glaze & Frost, 1984). In this regard, Mandich & Ritchie (1996) feel strongly that the characteristics of the sucking and swallowing patterns of infants who experience apnea need to be described in more detail. More specifically, limited research has been conducted on sucking behaviour as a component of feeding abilities and therefore as regulator of nutritional intake and growth (Casaer, Daniels, Devlieger, De Cock & Eggermont, 1982). Furthermore, limited research has been conducted on the oral-motor patterns used by premature infants for sucking and swallowing. Sucking patterns are usually studied in terms of rhythm used during sucking (Braun & Palmer, 1985; Ramsey & Gisel, 1996), the intra-oral pressure on the teats, or the movement of the jaw whilst sucking (DeMonterice et al., 1992). Palmer, Crawley & Blanco (1993:28), stated "Poor feeding patterns have not, however, been well described or defined. Clinical observations of feeding difficulties have traditionally been described as "weak suck, poor suck", and "difficulty in coordinating suck, swallow, and breathing." DeMontrice et al. (1992) feel that further research is needed to define the maturational patterns of sucking, swallowing and breathing co-ordination in

preterm infants. Herman (1991) found that many failure-to-thrive (FTT) infants had mild oral-motor dysfunction, which often goes unrecognised until years later when the child is referred for malnutrition and with a history of difficulty to feed. If the feeding problem as mentioned had been identified and managed earlier, complications could have been avoided. For intervention to be effective, the problem must be defined adequately (Bu'Lock et al., 1990). **It can therefore be concluded that a need exists to describe the oral feeding skills, as well as their maturational patterns, in the premature infant in a comprehensive and holistic way.**

According to Bu'Lock et al. (1990), feeding skills can be adequately defined by careful history taking, examination of the infant in combination with observation of the mother feeding the infant. Examination can also be carried out according to feeding assessment scales. A number of feeding scales have been developed, e.g. "The Neonatal Oral-Motor Scale" (Braun & Palmer, 1985), "The Behavioural Assessment Scale of Oral Function in Feeding" (Stratton, 1981), "The Prespeech Assessment Scale" (Morris, 1987), "Behavioural Assessment Scale of Oral Functions" (Stratton, 1981), "RIC Clinical Evaluation of Dysphagia: Pediatrics" (Cherney, 1994) and Jelm's (1990) "Oral Motor Feeding Rating Scale". The use of the above-mentioned scales poses certain limitations on the comprehensive evaluation and description of the feeding skills of the premature infant. Most of these scales only assess the oral phase of swallowing. Swallowing (deglutition), however, occurs in four phases, namely the oral preparatory, oral, pharyngeal and oesophageal phases. This is rarely recognised in the existing evaluation procedures. The "RIC Clinical Evaluation of Dysphagia: Pediatrics" (Cherney, 1994) does include all four phases of swallowing and provides norms from birth to 24 months. The biggest portion of this evaluation protocol, however, evaluates the ability to manage solids, semisolids and chewing and is therefore not relevant for describing the feeding patterns of preterm infants.

As discussed earlier, feeding of premature infants involves many aspects other than sucking. The preterm infant may experience very specific feeding problems (Arvedson & Brodsky, 1993; Creger, 1995; Vergara, 1993; Wolf & Glass, 1991). The above-mentioned scales also do not consider the physiological or cardiorespiratory responses of the infant to oral feeding, detailed assessment of nutritional and non-nutritional feeding, the interaction between infant and caregiver and the effectiveness of this interaction during oral feeding. It appears that no single comprehensive feeding evaluation scale for the premature population currently exists (Vergara, 1993).

It can be concluded that, although research has been conducted and oral feeding scales have been designed to assess infants' feeding skills, they appear to describe and evaluate the oral feeding skills of premature infants only to a limited degree. The question arises: **which tool or evaluation form can be used to enable the researcher to comprehensively evaluate and describe oral feeding skills of the premature infant?**

1.3 AIM OF STUDY

The aim of this study is to comprehensively describe the oral feeding skills and feeding associated behaviour of the premature infant during bottle- and cup-feeding (Figure 1.1). This comprehensive evaluation will provide the feeding specialist with guidelines for appropriate feeding intervention. This study further aims to contribute to a solution to the problem of inadequate infant feeding assessment scales for premature and other at-risk infants. Part of the solution will be to design a safe, reliable and comprehensive procedure for the evaluation and description of an infant's oral feeding skills whilst bottle-, breast-, or cupfeeding. The comprehensive evaluation will have a holistic approach, which means that aspects such as physiological status, medical status and feeding skills will all be

considered. The result of the interaction between these aspects will ultimately determine the oral feeding ability of the infant as illustrated in Figure 1.1.

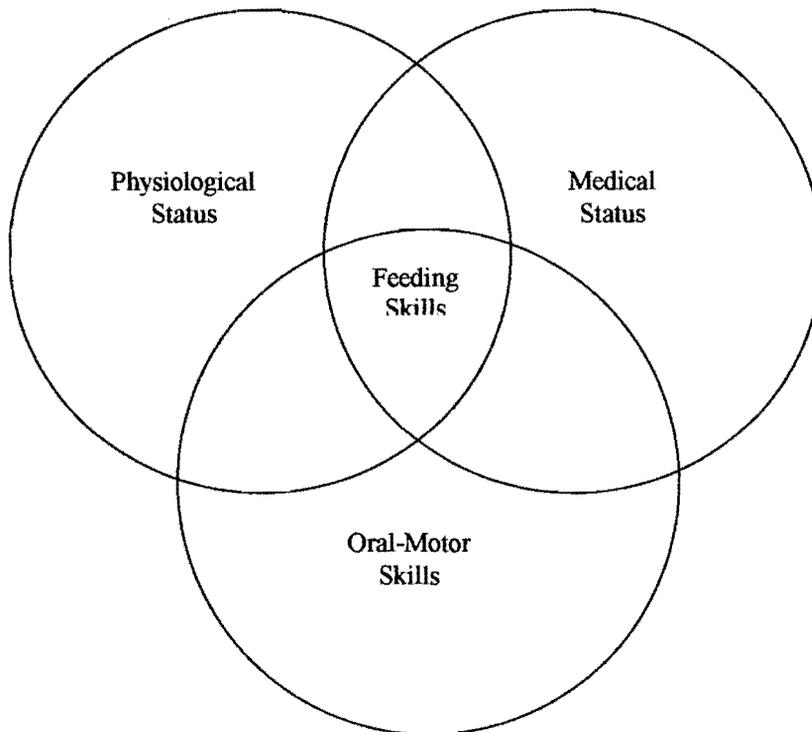


Figure 1.1 The interaction of aspects determining the feeding skills of the premature infant.

This comprehensive evaluation will provide the feeding specialist with adequate information to plan the safest, most effective and efficient feeding therapy. Comprehensive evaluation of the infant's feeding abilities is a prerequisite for appropriate, accountable management of oral feeding (Lau & Hurst, 1999).

1.4 DESCRIPTION OF TERMINOLOGY

The terms used in this study are clarified below by providing brief descriptions:

1.4.1 PREMATURE/PRETERM INFANT

A premature infant is an infant born at or before 36 weeks of gestation. Prematurity is divided into three groups according to the degree of prematurity, *Mild prematurity* refers to infants born between 35 and 36 weeks gestational age, *moderate prematurity* refers to infants born between 31 and 34 weeks gestational age and *extreme prematurity* refers to infants born between 24 and 30 weeks gestational age. In the USA, premature deliveries account for 5% of all live deliveries (Rossetti, 1996). At the Pretoria Academic Hospital the percentage of preterm deliveries appears to be in the vicinity of 15% (De Witt et al., 2000).

1.4.2 ORAL FEEDING SKILLS

An infant needs certain skills to enable him/her to take in fluids through his/her mouth (orally) as against by a nasogastric tube. These skills include the ability to extract fluid from the teat or cup by sucking, to co-ordinate sucking, swallowing and breathing efficiently and safely, and to swallow the fluid without aspirating, or experiencing stress or discomfort in doing so (Rosenthal et al., 1995).

1.4.3 AT-RISK FACTORS

Any factor that interferes with the infant's ability to develop according to known patterns and developmental sequences or to interact with the environment in a normal manner, is termed a risk factor. An infant who is exposed to such factor/s is said to be at-risk for developmental delay (any kind of developmental; communication, feeding, motor, etc.). These factors could be biological or environmental in nature or an established factor (Rossetti, 1996)

1.4.4 FEEDING SPECIALIST

The term feeding specialist used in this study refers to the professional person involved with the management of feeding problems. This professional person may be a speech-language therapist, an occupational therapist or a physiotherapist, but must have received specialised training in the assessment of and intervention in oral feeding problems (Hunter et al., 1994; Hyde & Jonkey, 1994).

1.4.5 DEGLUTITION

Deglutition is commonly known as swallowing and can be defined as the semi-automatic motor action of the muscles of the respiratory and gastro-intestinal tracts that propels food from the oral cavity to the stomach (Miller, 1986; Rosenthal et al., 1995).

1.4.6 ABBREVIATIONS

NICU:	Neonatal intensive care unit
VLBW/LBW:	Very low birth weight/low birth weight
SGA/AGA:	Small for gestational age/Appropriate for gestational age
RDS:	Respiratory distress syndrome
HIE:	Hypoxic Ischemic encephalopathy
NNS:	Non- nutritional/nutritive sucking
NS:	Nutritional/nutritive sucking
WHO:	World Health Organisation

1.5 CHAPTER OUTLAY

This thesis contains six chapters and a brief description of each chapter follows.

1.5.1 CHAPTER 1

A general introduction to the problems encountered in the evaluation and management of the feeding skills of the premature infant and the role of the speech-language therapist is provided to serve as a rationale for this study. A solution is proposed, terminology is explained and a chapter outlay is provided.

1.5.2 CHAPTER 2

The general characteristics of the premature infant; the risk factors leading to developmental delays and feeding problems; the medical complications common in premature infants and the influence thereof on the feeding abilities and behaviour of infants are discussed. This forms part of the theoretical underpinning for the evaluation of the feeding skills of the premature infant, as proposed by this study.

1.5.3 CHAPTER 3

This chapter provides an overview of the mechanics of the sucking and swallowing process in infants, the phases of deglutition (swallowing), the development of feeding skills in infants and the specific feeding problems of premature infants. This information will expand on the basis upon which the design of a comprehensive evaluation procedure for premature infants is based.

1.5.4 CHAPTER 4

The research methodology of this study is presented in this chapter. The study is divided into two phases. The first phase comprising the development of the evaluation form and a pilot study, is described. The second phase is discussed in terms of the aims, research design and the selection criteria of the subjects that

were followed. Reliability and validity of this study are discussed briefly. A description of the material and apparatus as well as the data collection and analysis procedures used to execute each of the phases of this study is provided.

1.5.5 CHAPTER 5

The results of the study and the discussion thereof are presented. Figures and tables are used to illustrate the results. These results are discussed according to the aims and with reference to the relevant literature. Patterns and developmental trends in the feeding skills of premature infants in their different gestational ages and their ability to cope with bottle and cup feedings are identified and discussed.

1.5.6 CHAPTER 6

The implications of the results on clinical practice and further research are discussed. Conclusions are drawn, a critical evaluation of the study is done and recommendations for further research are made.

1.6 CONCLUSION

Premature infants experience many serious problems and oral feeding problems forms a major part of it. According to a literature review, it is concluded that a need to comprehensively describe the oral feeding skills of premature infants exists. Furthermore, a need for a comprehensive evaluation tool was identified to make the description of the oral feeding skill of premature infant in a holistic way, possible.

1.7 SUMMARY

Chapter one describes the role of the speech-language therapist as feeding specialist, the importance of effective oral feeding to the premature infant and the limitations posed by the literature and existing feeding scales on the feeding specialist in fulfilling this role. The need for a comprehensive evaluation procedure/tool to enable the speech-language therapist to provide accountable, effective service delivery regarding feeding problems is motivated. A description of the terminology used in the study is provided as well as an outlay of the chapters.