Stress Experiences of Parents with Premature Infants in a Special Care Nursery

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Abstract

This project is a controlled prospective longitudinal study of stress experiences of parents with premature infants born from 30-35 weeks gestation being cared for in a tertiary special care nursery (SCN). Sixty mothers and 59 fathers of premature infants and 60 mothers and fathers of term infants were recruited into the study. A range of repeated self-reports and biochemical markers of stress (cortisol and tribulin) were carried out on 5 measuring times through approximately a total of 24 weeks for parents of premature infants and 17 weeks for parents of term infants.

Parents of premature infants reported higher stress levels than parents of term infants within the first week of infant's birth but had lower biochemical markers of stress. The stressors perceived by these parents in a SCN were appearance and behaviour of the infants and the delayed in performing the parental role. Parents used both emotion- and problem-focused coping strategies to deal with the stressful events.

A follow-up telephone interview of these parents a year after the birth of their premature infant found that most parents expressed the experience as positive. A few parents were concerned over the neurodevelopmental and cognitive outcomes of their infants. Implications for clinical practice were discussed.

Signed Statement

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief this thesis contains no material previously published or written by another person except where due reference is made in the body of the text.

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LIST OF TABLES

LIST OF TABLES - CONTINUED

LIST OF TABLES - CONTINUED

LIST OF FiGURES

ABBREVIATIONS

SCN	special care nursery
NICU	neonatal intensive care unit
HITH	hospital-in-the -home
SGA	small for gestational age
AGA	appropriate for gestational age
LGA	large for gestational age
LBW	low birth weight
VLBW	very low birth weight
ELBW	extremely low birth weight
ABS	Australian Bureau of Statistics
IVH	intraventicular haemorrhage
BPD	bronchopulmonary dysplasia
ROP	retinopathy of prematurity
SAM	sympathetic-adreno medullary
HPAC	hypothalamic-pituitary-adrenal cortical
ACTH	adrenocorticotropic hormone
CRF	corticotropin releasing hormone
CeA	central amygdala
MeA	medial amygdala
PVN	paraventricular nucleus
MAO	monoamine oxidase

GLOSSARY

Prematurity/Preterm	less than 37 completed weeks of pregnancy
Term	between 37-42 completed weeks of pregnancy
Postterm/Postmature	more than 42 completed weeks of pregnancy
LBW	2500g or less at birth
VLBW	less than 1500g at birth
ELBW	less than 1000g at birth
SGA/SFD	birth weight below the 10th percentile
LGA	birth weight above the 90th percentile
AGA	birth weight between the 10th and 90th percentile
Perinatal period	period from 24 weeks of gestation (168 days) to 7 days of postnatal age, irrespective of birth weight and gestation at delivery
Neonatal period	first 28 days of life, irrespective of the gestation at delivery
Infant	a baby born from the moment of birth to his/ her first birthday (365 days), irrespective of the gestation at birth
Neonatal mortality rate	number of deaths occurring in the first 28 days of per l000 live birth. The early neonatal mortality rate refers to the number of deaths occurring 0-6 days after birth per 1000 live births
Perinatal mortality rate	number of fetal deaths plus early neonatal deaths per1000 total live births
Infant mortality rate	number of babies who die in the first year of life (0-365 days) expressed per 1000 live births

GLOSSARY - CONTINUED

Nagele's Rule	adding 7 days to the first day of the last Menstrual period, subtracting 3 months and adding 1 year
Apnoea	a pause in breathing of more than 20 seconds or less than 20 seconds associated with bradycardia
BPD	respiratory sequelae in an infant requiring oxygen at more than 28 days after birth (Shennan, 1988)
IVH	escape of blood from within the brain's ventricle. Four classifications: Grade I- isolated germinal matrix haemorrhage Grade II- rupture of the haemorrhage into the ventricle but without ventricular dilatation Grade III- rupture of the haemorrhage into the ventricle with ventricular dilatation Grade IV- IVH with parenchymal extension
ROP	disorder of the developing retinal vasculation resulting in the development of new abnormal blood vessels, which may heal or progress to a chronic phase with scarring, retinal detachment and visual loss

LIST OF PRESENTATIONS/PUBLICATIONS

The following presentations or publications have arisen as a result of this dissertation.

Oral Presentations

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Poster Presentations

Lau, R. and Morse, C. Parents' coping in special care nursery. 4th Annual Congress of the Perinatal Society of Australia and New Zealand. Brisbane, Australia. 2000

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Journal Articles

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CONTENTS

Contents - Continued

Chapter 1	Overview of premature/preterm infant	Page

Chapter 1

Overview of premature/preterm infant

Everything ought to be done to ensure that an infant be born at term, well developed, and in a healthy condition. But in spite of every care, infants are born prematurely……

Pierre Budin

The Nursling (1907, p.69)

1. Introduction

Before 1960 prematurity was defined as the birth of an infant weighing 2500g or less (Southgate and Pittard, 2001). This definition was useful due to the fact that birth weight was the most frequently used and reliably recorded measure of infants (Allen, 1998). Until the 1960s birth weight was used to identify newborn infants for potential risk of mortality and morbidity (Lumley, 1987). For example, studies on long-term growth and development in premature infants consistently indicate birth weight as one of the most important variables in determining outcome (Hack et al., 1994). Infants defined by a birth weight of less than 2500g had a higher risk of adverse outcomes such as mental retardation, cerebral palsy and death (Lumley, 1987). However, health care professionals caring for premature/preterm and term infants observed that not all of these infants required the same level of care (Leppink, 1986). This prompted the

American Academy of Pediatrics, through its Committee on the Fetus and Newborn, to recommend that all newborns be classified by birth weight, gestational age, and some standard of intrauterine growth (Silverman, 1967). In the United States, the work of Battaglia and Lubchenco has been instrumental in establishing acceptable standards for birth weight, gestational age, and intrauterine growth (Lubchenco et al., 1963; Battaglia and Lubchenco, 1967).

Battaglia and Lubchenco (1967) set the separation between premature and term infants at 38 weeks gestation, having arrived at this separation after looking at the distribution of births by gestational age. They found that the peak birth rate is at 40 weeks, with 80% of deliveries occurring within two weeks on either side from 38 to 42 weeks. Thus, infants can be classified as premature when less than 38 weeks' gestation, term when born between 38-42 weeks' gestation, and postmature if born at more than 42 weeks' gestation. Based on the intrauterine growth for gestational age, 80% of births fall between the 10^{th} and 90^{th} percentiles. By these assessments, newborns can be classified as appropriate-for-gestational-age (AGA) with birth weights between the 10^{th} and 90^{th} percentiles; small-for-gestational-age (SGA) with birth weights below the 10^{th} percentiles; and large-for-gestational-age (LGA) with birth weights above the 90^{th} percentile (Leppink, 1986). Eventually, six categories emerged, three by intrauterine growth pattern (small-for-gestational-age, appropriate-for-gestational-age, and large-for-gestational age) and three by gestational age (premature, term, postmature) (Battaglia and Lubchenco, 1967).

There were limitations in the studies carried out to develop an instrument to determine gestational age of an infant. Battaglia and Lubchenco (1967) evaluated an instrument to assess gestational age of an infant. The instrument was developed from the Colorado study (Lubchenco et al., 1963) utilising samples from low-income families. They found term infants had lowered mean weight than from other centres in the United States and United Kingdom. Findings have to be interpreted with caution because of the selective sampling.

The World Health Organisation (1977) defined a premature infant as one born before 37 completed weeks of gestation or less than 259 days since the first day of the last menstrual period of the mother. This definition is distinct from “low birth weight” which describes infants with a birth weight below 2500g, and includes appropriate-for-gestational-age premature infants and small-for-gestational-age premature and term infants (Mayfield et al., 1990). The term “very low birth weight” (VLBW) infants refers to premature infants born at less than 1500g, while the term “extremely low birth weight” (ELBW) has been adopted to describe premature infants whose birth weight is less than 1000g (Yu and Hollingsworth, 1980).

1.1 **Assessment of gestational age**

There are several ways of assessing the gestation of an infant. In about 80% of cases a careful history of the date of the mother's last menstrual period is the best guide to the length of gestation (Johnston, 1994). This calculation is reliable provided the mother is certain about her menstrual period. Using the mother's last menstrual period, the estimated date of birth is calculated using Nagele's Rule, which has been shown to be reasonably accurate and is the method commonly used. Nagele's Rule refers to the addition of 7 days to the first day of the last menstrual period, subtracting three months, and adding one year. However, Nagele's Rule assumes that the woman has a 28-day cycle and that the pregnancy occurred on the fourteenth day. An adjustment of the expected date of birth is necessary if the menstrual cycle is longer or shorter than 28 days. With the use of Nagele's Rule, only about 4% to 10% of women give birth spontaneously on the estimated date of birth. Most women give birth during the period extending from seven days after the estimated date of birth (Klein, 1995).

During early pregnancy at between 10 and 20 weeks, the use of ultrasound is applied to measure the size of the uterus and the biparietal diameter of the fetal head. This is a technique by which short pulses of high frequency low intensity sound waves are transmitted from a piezo-elective crystal (transducer) through the maternal abdomen to the uterus and the fetus (Veille et al., 1993) to increase the accuracy of the assessment (Kelnar and Harvey, 1987). The biparietal diameter of the fetal head increases in an almost linear fashion throughout gestation. Serial measurements of the head size can be used to establish a rate of growth that may distinguish between a premature fetus, whose rate of growth is rapid and the fetus whose head is small due to intrauterine growth retardation (Leppink, 1986).

After birth there are three techniques most commonly used to determine gestational age of the infant. They are (1) assessment of the infant's external physical characteristics, (2) assessment of the infant's neuro-muscular maturity, and (3) the application of a scoring system that combines scores of the external physical characteristics and the neuromuscular maturity of the infant (Sweet, 1986). Two methods of evaluation of the gestational age have been used over the past thirty years. Dubowitz and colleagues (1970) devised a scoring system combining the external physical characteristics and neurological evaluations. This system was subsequently superseded by Ballard and colleagues (1979) method of an abbreviated form of the Dubowitz score. Compared with reliable ultrasound dates, the Ballard score tended to overestimate the gestational age of premature infants and under-estimate the gestational age of postmature infants (Alexander et al., 1992). It was particularly inaccurate with very low birth weight infants, producing a difference of over two weeks gestational age (Saunders et al., 1991). A revised Ballard score (Ballard et al., 1991) includes neurological and physical characteristics that might differentiate extremely premature infants from more mature infants. The revision incorporated a score of –1 into the criterion when a certain characteristic was absent. This method has led to increasing the accuracy of gestational age assessment to within one week.

1.2 **Causes of premature labour**

Premature delivery is about equally distributed between those instances that follow spontaneous early onset of labour and those in which the early labour is elective i.e. elective caesarean section (Johnston, 1994). The aetiology of premature labour is multifaceted but can be broadly classified under four headings: (1) complications of pregnancy, (2) socio-demographic factors, (3) iatrogenic factors, and (4) unknown causes (Lipshitz et al., 1993; Freda et al., 1991). It is common that women who have cervical incompetence tend to have a premature delivery (Kelnar and Harvey, 1987), especially between 20-24 weeks. Placenta praevia and abruptio both frequently result in premature deliveries (Harlow and Spencer, 1999). Other factors occurring in 20% to 50% of premature labour is multiple pregnancy most likely due to over distension of the uterus (Revenis and Johnson-Robbins, 1999). Maternal illness, including hypertension, diabetes, cardiac and renal disease, may result in premature delivery as a result of either spontaneous labour or obstetric intervention such as induction of labour due to the risk the illness poses on the mother (Brackley and Rubin, 1999).

Socio-demographic risk factors also play a role in premature birth. These include lower socioeconomic status, poor maternal nutrition, poor antenatal attendance and care, and pregnancy at a young age (< 18 years) (Wildschut, 1999). It has been reported that the younger the mother, the lighter the infant and the higher is the rate of premature delivery (Macfarlane et al., 1999). Maternal smoking is an important risk factor for premature birth and may contribute to 17% of all known causes (Wright et al., 1998). Cigarette smoking during pregnancy reduces the eventual fetal birth weight and is related directly to the number of cigarettes smoked (Lieberman et al., 1994). Birth weight at term is reduced an average of 170g if more than 10 cigarettes are smoked per day; and if more than 15 cigarettes are smoked per day this may reduce the infant’s weight by 300g (Kliegman, 1997). Of all other epidemiological factors, a history of previous premature delivery correlates most strongly with subsequent spontaneous premature birth. Women with one previous spontaneous premature delivery have a 37% risk of having a second, and those with two or more premature deliveries have a 70% risk of further delivering a premature infant (Keirse et al., 1978).

1.3 **Common problems of the premature infant**

The major problems faced by premature infants relate to the degree of maturity of their organ systems with a direct correlation between the degree of immaturity and severity of the problems. Infants who are delivered prematurely are at risk of various problems, which complicate their immediate neonatal and subsequent development even though most of these problems are potentially preventable or treatable. Some of the common problems faced by all premature infants are :

1.31 Hypothermia

Maintaining the premature infant in the appropriate temperature becomes one of the most important factors in the effort to decrease neonatal morbidity and mortality. Premature infants are prone to hypothermia for a number of reasons: (1) a greater surface-area-to-weight-ratio, (2) low brown fat stores, (3) less subcutaneous tissue, and (4) a flaccid posture which increases the surface exposed to the environment (Lemons and Bradburn, 1988). To overcome these effects, the premature infant should be nursed in a neutral thermal environment, defined as the environmental temperature at which the infant maintains a normal body temperature at the lowest level of energy expenditure and therefore minimal oxygen consumption (Hey, 1994). So, if the temperature of the premature infant can be maintained within that range the caloric expenditure will be decreased (Lemons and Bradburn, 1988).

1.32 Respiratory problems

(a) Respiratory distress syndrome

The improvement in neonatal survival and morbidity in the last 15 years is due to the effective management of respiratory problems (Black and Whitfield, 1991). Respiratory distress syndrome or hyaline membrane disease is the most common cause of distress in premature infants (Bucuvalas and Balistreri, 1995), and affects between 10% to 20% (Wyly, 1995) of all newborns at risk. Respiratory distress syndrome may affect up to 70% of infants born between 28-30 weeks gestation (Pettett, 1986), and occurs because the lung is deficient in pulmonary surfactant, a surface tension reducing agent that prevents alveolar collapse at the end of the expiratory phase, resulting in a loss of lung volume (Hansen and Corbet, 1998). Thus, surfactant has two main functions in the lungs: (1) reduction of surface tension so that less pressure is required to keep the alveoli open; and (2) maintaining alveolar stability by varying the surface tension with alveolar size. Surfactant deficiency results in a decreased lung compliance, alveolar hypotension and imbalance between pulmonary ventilation and perfusion and subsequent hypoxaemia and hypercarbia. Surfactant replacement therapy may be initiated at birth in premature infants at risk of respiratory distress syndrome. Therapeutic interventions include: maintaining adequate ventilation and oxygenation; correcting acid-base imbalances; maintaining neutral thermal environment; maintaining fluid and electrolytes; optimising caloric intake and growth; and promoting parent-infant attachment (Whitsett et al., 1994; Hubbell and Webster, 1986).

(b) Apnoea of prematurity

Premature infants are prone to recurrent bouts of apnoea. Apnoea is defined as the cessation of breathing for greater than 20 seconds or the cessation of breathing accompanied by a decrease in heart rate and/or the presence of cyanosis (Gross, 1990). The premature infant's central nervous system and the respiratory control centre in the medulla which establishes the basic rhythm of respiration is immature. Some researchers believe that rapid eye movement (REM) sleep increases the incidence of apnoea (Bradburn and Schreiner, 1988). During REM sleep, inhibition of the intercostal muscles occurs leaving respiration more dependent on the muscles of the diaphragm. In premature infants, the diaphragmatic muscles tire easily.

Time is the main factor in determining the sequence of pathophysiological events associated with apnoea. The longer the apnoeic episode lasts, the more serious are the metabolic, cardiocirculatory and cerebral effects (Kapplus, 1985). The apnoea may be treated with gentle tactile stimulation (Milner, 1999) (for example, gentle rubbing of the infant's back or the soles of the feet). A group of medications known as methylxanthines such as theophylline and caffeine are used to treat apnoea of prematurity and have been shown to reduce apnoeic episodes by 60-90% in premature infants (Murat et al., 1981). These medications increase the sensitivity of the respiratory centre to carbon dioxide and also exert a central stimulatory effect on brain stem respiratory neurons, often markedly decreasing the frequency and severity of apnoeic episodes. Methylxanthines also increase alveolar ventilation causing a reduction in arterial carbon dioxide (Gross, 1990).

1.33 Hypoglycaemia

Premature infants are prone to hypoglycaemia because of a smaller reserve of liver glycogen stores and the increased metabolic demands imposed by extrauterine life (Polk, 1998). Hypoglycaemia is common in infants of low birth weight, particularly in those with intrauterine growth retardation. These infants have considerably reduced fat deposits for the provision of free fatty acids as a fuel substitute for glycogen (Polk, 1998). Hypoglycaemia is further accentuated by cold stress, respiratory distress, perinatal asphyxia and sepsis (Polk, 1998; Yu, 1987). Careful monitoring of blood glucose levels and observing for clinical symptoms (jitteriness, lethargy, poor feeding, apnoea, cyanosis and seizures) are part of the routine care of the premature infant. If the infant is well early feeding will be introduced; or the infant will be fed intravenously with 10% glucose.

1.34 Hyperbilirubinaemia

To understand hyperbilirubinaemia in the premature infant, normal metabolism in the newborn must be reviewed. Approximately 80% of the body's bilirubin is formed from the breakdown of erythrocytes (Korones, 1986). Haemoglobin is then split into the two fragments, heme and globin. The unconjugated bilirubin is formed from heme in the reticulo-endothedial cells that are primarily located in the spleen and liver. The normal newborn's production of bilirubin is 102 to 136 mmol/kg body weight per 24 hours. This is about 2.5 times the rate of bilirubin production in adults (Maisels, 1994).

The increased production of bilirubin in sick premature infants is partially explained by an average red cell life span as low as 30 days, compared to 60-70 days in the healthy term infant (Ives, 1999). Secondly, there is a diminished capacity of the liver to excrete the excessive bilirubin delivered to it. Hyperbilirubinaemia is therefore a common occurrence in all neonates but jaundice occurs in only half of them because serum bilirubin levels must exceed 68 to 102 mmol before it is visible as pigment in the skin. In premature infants, jaundice is first evident after 48 hours and disappears by the 9^{th} or 10^{th} day. To treat this, phototherapy is used which provides an artificial source of light that changes bilirubin into non-toxic, water soluble isomers which can be excreted in the urine and faeces (Korones, 1986).

1.35 <u>Fluid and electrolytes needs</u>

Careful management of fluid and electrolytes balance is a critical feature in the care of premature infants and will enhance their survival and developmental outcomes (Bell and Oh, 1994). Balance of electrolytes is necessary to maintain cell membrane potentials, movement of substances into and out of cellular compartments, and continued tissue growth (Seri and Evans, 1998). If the premature infant is unable to be fed orally, parenteral nutrition is introduced (intravenous delivery of a hypertonic solution containing dextrose, amino acids, protein, carbohydrates, fats, electrolytes, minerals, vitamins and trace elements) to provide adequate nutrition and achieve normal growth rates (Yu, 1987; Kalhan and Price, 2001).

1.4 **Outcome of premature infants**

The advance of improved technologies has increased the survival rate of premature infants. Most premature infants are discharged from the hospital and do well, while, some go on to develop disabilities or chronic medical conditions requiring frequent hospitalisation. Premature infants, however, are more likely to require readmission to the hospital after discharge, particularly in the first year of life (Blackburn, 1995). Reported rates of hospital readmission within the first year range from 25% to 50% for premature infants compared to 8% to 10% for term infants and with rates as high as 10% for the premature infants during the second year. The VLBW infants have the highest rate of hospital readmission during the first year for continuing care of chronic health problems such as bronchopulmonary dysplasia (BPD), cardiac and gastrointestinal problems, inguinal hernia and infection of the lower respiratory tract and otitis media (Mitchell and Najak, 1989; Mutch et al., 1986; Termini et al., 1990). The likelihood of readmission to the hospital for the very low birth weight infant has been reported to be as high as 38% (Dusick, 1997). With survival rates of premature infants now improving for 95% of infants weighing between 1500g to 2500g and 80% for those infants weighing 1000g and 1499g, the neurodevelopmental deficits that are seen predominate in those infants weighing less than 1500g (Bucciarelli, 1994).

Although preterm infants have an increased risk of neurodevelopmental disabilities compared with the general population, most do not have major disability and are within the normal range (Allen, 1998). The more immature the infants the higher the incidence of chronic lung disease and neurodevelopmental disability (Allen et al., 1993, Regev et al., 1995). When compared with full term control subjects, preterm infants have higher incidences of minor neuromotor dysfunction, language delay, visual-perceptual problems, reading and arithmetic difficulties, and behaviour problems (Hall et al., 1995; McCormick et al., 1996; Ross et al., 1991). Therefore, as a group, premature infants continue to have a higher incidence of continuing problems than do term infants.

Caution must be taken in interpreting follow-up data of premature infants because minor neuromuscular abnormalities seen in the immediate neonatal period may not persist, while significant abnormal cognitive functions may not be detected until the infant is older (Bucciarelli, 1994). Neurologic maturation occurs in the first year of life of VLBW infants. Neurologic findings such as hypertonicity, jerky movements and tremors, which may be present at term, three months or six months of age may be resolved by 12 months of age (Vohr and Msall, 1997). In contrast, while cerebral palsy may be difficult to diagnose at three months of age; the diagnosis is made possible by 12 to 18 months of age (Vohr and Msall, 1997). Therefore, follow-up of these infants becomes important when evaluating neurologic sequelae. In infants who appeared to be normal at 18 months of age, subtle or covert problems in coordination and learning may become apparent later, particularly at the time of school entry at age five or six years (Nickel et al., 1982). Deficits in fine motor skills have been reported, particularly for those infants weighing less than 1000g. Crowe and colleagues (1988) found those premature infants weighing less than 1000g have significantly poorer fine motor skills than infants weighing 1001-1500g. While preterm children demonstrate a normal range of intelligence, a meta-analysis of 80 studies published between 1979 and 1989 found that the mean I.Q. for LBW children aged between two to five years was 97.8 (± 6.2). This is significantly lower than that of full-term infants 103.8 (± 8.2) (Aylward et al., 1989). The Bayley Scales of Infant Development was the most frequently used assessment instrument

(45%), followed by the Stanford-Binet test (30%), Wechsler Intelligence Scale for Children or Wechsler Intelligence Scale for Children-Revised (21%), Gesell test (10%), Wechsler Preschool and Primary Scales of Intelligence (10%), Griffiths Mental Development Scale (9%), and McCarthy Scales of Children's Abilities (6%).

Studies of outcomes of prematurity have shown that in the preschool and elementary school years, a significant number of premature infant survivors are more prone to behavioural difficulties such as poor concentration, hyperactivity, and attention deficits (Gillberg and Gillberg, 1989; Hadders-Algra et al., 1988). Grogaard and colleagues (1990) reported in the United States an 18% incidence of major handicaps in infants at 18 months' follow up who were born weighing less than 1500g. Cerebral palsy was found in 7.6%, and 6.5% were mentally retarded with developmental quotients of less than 70%; severe retinopathy of prematurity occurred in 5.5%, and neurosensory hearing loss in 5.4%.

The increased survival of VLBW infants since 1980s has resulted in a rise in the incidence of bronchopulmonary dysplasia. The prevalence of BPD has been reported between 15% to 47% in infants with birth weights less than 1500g (Hoekstra et al., 1991; Abman and Groothius, 1994; Shennan et al., 1988). However, the incidence of BPD depends on the definition adopted. Bancalari's definition (1979) included the use of mechanical ventilation in the first two weeks of life, requiring oxygen at four weeks, and radiographic changes of the lungs. Shennan and colleagues (1988) re-evaluated Bancalari's definiton of BPD and found that defining BPD as the use of oxygen at 36 weeks of postconceptual age is a sensitive predictor of abnormal pulmonary outcome at 24 months. Shennan and colleagues (1988) found that no oxygen requirement at 36 weeks postconceptual age predicted normal pulmonary outcome in 90% of children and 19.7% of the VLBW who had required oxygen had abnormal findings at 24 months.

Intraventricular haemorrhage (IVH) is an important predictor of later handicap. Although grade I and II haemorrhages do not appear to increase the incidence of major handicap in infants less than 1500g (Papile et al., 1983), grade III intraventricular haemorrhage has been found to be associated with a 36% handicap rate, and grade IV is associated with a 76% major handicap rate. As well, hydrocephalus occurs with grade III or IV intraventricular haemorrhage which further increases the severity of handicap. As many as 80-90% of infants with hydrocephalus will require a shunt (Blackburn, 1995).

The risk of visual impairment from retinopathy of prematurity (ROP) is well documented. The incidence of ROP increases with decreasing gestational age (Blackburn, 1995). ROP causes severe visual impairment in up to 5.5% of LBW infants, 4% to 12% of VLBW infants and 4% to 25% in ELBW infants (Keith and Doyle, 1995). Severe visual handicap due to retinopathy of prematurity is confined to a small number of infants below 1000g (Flynn and Phelps, 1988). Keith and Kitchen (1984) examined 108 infants weighing less than 1000g at birth from The Royal Women's Hospital in Victoria, Australia from 1977 to 1982 for evidence of retinopathy of prematurity. They found that 56% had no ROP, 17% had mild ROP and 27% had severe ROP. There has been an awareness of the strong association between oxygen fluctuation and high oxygen saturation with ROP. Therefore careful monitoring of the infants treated with oxygen may contribute to the decrease in the condition. In addition, other contributing factors may be early screening of high-risk infants with early detection and treatment of the condition. The prevalence of visual impairment in surviving low birth weight infants is about 5% (Pinto-Martin et al., 1996) and a further 5% of these impairments, mainly due to myopia. There is also a very large prevalence of squint in up to 20% of premature infants (Pinto-Martin et al., 1996).

Preterm infants are thought to be at risk for hearing loss due to hypoxaemia, hypotension, intracranial haemorrhage, systemic infection and ototoxic drug exposure (Dusick, 1997). Some degree of hearing impairment occurs in 1% to 5% of VLBW infants (Robertson et al., 1994). The Victoria Infant Collaboration Study Group in Australia reported that

2% of the ELBW infants required hearing aids for sensorineural deafness. Overall, sensorineural hearing loss has been reported in 0.7% to 2% of the VLBW population (Dusick, 1997).

1.5 **Major measures of outcomes**

1.51 <u>Infant mortality rate</u>

At the beginning of this century, the infant mortality rate was high and many deaths occurred in the first few days of newborn infants (Kelnar and Harvey, 1987). Economic, social, environmental, and medical factors all played a part in the infant's mortality rate (Newland, 1981). With better understanding of how diseases are spread and controlled, improved sewage systems, comprehensive health care services and improved standards of living there has been a sharp decrease in infant mortality and morbidity over the course of the twentieth century. McCormick (1985) commented that now prematurity is the major determinant of infant mortality in Australia, Europe and North America.

In the late 19th century in Europe, infant mortality was extremely high and varied quite markedly from one country to another, ranging from around 100 per 1,000 live births in Norway and Sweden to 200 or even 250 per 1,000 live births in countries including Germany, Austria, and Russia (Mitchell, 1980). By 1950, most infant mortality rates ranged between 20-80 per 1,000 live births, gradually reducing till around 1985 infant deaths ranged between less than 10 per 1,000 live births in northern and Western European countries and in several countries of Eastern Europe (Corsini and Viazzo, 1997). The Australian infant mortality rate in 1998 was estimated to be 6 per 1,000 live births which compares well with that of most developed countries. It is similar to Canada, France, the Netherlands and Sweden (Day et al., 1999).

In Australia in the early 1900s, infant mortality was around 100 deaths per 1,000 live births. This rate fell below 50 by the mid-1920s and since 1983 has been below 10 deaths for 1,000 live births. The infant mortality rate recorded for 1996 was 5.8 per 1,000 live births (ABS, 1982-1996). There was a substantially higher infant mortality rate among indigenous Australians compared with the rest of the Australian population. The indigenous infant mortality (1,857 deaths per 100,000 indigenous live births) is almost four times higher than the non-indigenous rate (500 infants deaths per 100,000 non-indigenous live births) (ABS, 1982-1996).

1.52 <u>Neonatal mortality rate</u>

During the past 20 years the rapid decline in neonatal mortality has been attributed to improvements in high-risk obstetric and neonatal intensive care. The continued improvement in birth weight specific survival e.g. the very low birth weight infant (< 1500g) is due to advancing technologies. Improved obstetric care included better ultrasound imaging for estimating gestational age and for measures of fetal well-being (Alfirevic and Neilson, 1995; Manning et al., 1991) and antenatal corticosteriod treatment for fetal lung maturation (NIH Consensus Development Panel, 1995). Major therapeutic improvements in neonatal care have included the introduction of surfactant replacement therapy (Jobe, 1993), different modes of ventilation (Richardson et al., 1998) and corticosteriod treatment for chronic lung disease (Rastogi et al., 1996). Between 1989 to 1995 at two hospitals in Boston, Richardson and colleagues (1998) examined two cohorts of very low birth weight infants (<1500g). The first cohort was from 1989 to 1990 and the second cohort was from 1994 to 1995. A 45% decline in neonatal mortality was found overtime between the two cohorts. At the time of the first cohort, one of the hospitals served as an intermediate level intensive care unit and did not have a high-risk obstetric service. In the second cohort, the hospital was upgraded to a full tertiary level care hospital with a high risk perinatal service.

One-half of all neonatal deaths can be attributed to the following causes (Robert Wood Johnson Foundation, 1991):

1. Low birth weight
2. Acute perinatal asphyxia
3. Congenital anomalies
4. Perinatal infections

The neonatal death rate in Australia has fallen from 5.5 per 1,000 live births in 1985 to 3.5 per 1,000 live births in 1993 (ABS, 1994). In Australia, in 1993, there were 2,131 perinatal deaths. Of these, 866 were neonatal deaths. The main causes of neonatal deaths were hypoxia, birth asphyxia, respiratory conditions and congenital anomalies (ABS, 1994).

1.53 Perinatal mortality rate

The term "perinatal period" was introduced in 1936 by the German paediatrician Pfaundler who defined this period as the time just prior to, during, and immediately after birth (Bakketeig et al., 1984).
Improvements in the management of pregnancy-related complications, including better antenatal care, improved management of labour and the development of skilled intensive care for sick infants, particularly those of very low birth weight (Johnston, 1994) that has occurred during the last 20 years has resulted in a significant decrease in perinatal mortality rates to 9.7 deaths per 1000 live births for 1988 in the United States (U.S. Department of Health and Human Services, 1991). Still prematurity remains the most significant perinatal problem accounting for 75% of all perinatal mortalities (Fanaroff and Merkatz, 1993) and these rates increase as birth weight and gestational age decrease (Korones, 1986).

According to the Australian Bureau of Statistics (1994), there were 2,131 perinatal deaths registered in Australia during 1993, a 15% decrease from the 2,508 deaths in 1992. Of these deaths, 1,245 were fetal deaths (stillbirths) and 886 were neonatal deaths (children born alive who died within 28 days of birth). In 1993, 55% of perinatal deaths involved children weighing less than 2000g at birth and of this group, 60% weighed less than 1000g and 31% involved children with a gestational age of less than 28 weeks. The main causes of perinatal death in 1993 were hypoxia, birth asphyxia and other respiratory conditions.

1.6 **Historical perspective of care of premature infants**

In Paris, in the early 1800s, an obstetrician Pierre Budin showed an interest in premature birth and he went on to develop guidelines for the care of these infants (i.e. temperature control and gavage feeding). Pierre Budin pioneered the use of incubators for premature infants and his idea was taken to the United States by his student, Martin Cooney, who exhibited premature infants in incubators at fairs and expositions in the United States and Europe. The shows included the Berlin Exposition of 1869, the Pan American Exposition in 1901, and the Chicago World's Fair in 1932. These infants were not expected to live but in fact they survived and their parents were coaxed into taking them home. The success of these techniques led to the widespread adoption of these methods in North American hospitals. In 1922, Dr. Julian Hess established the first nursery for premature infants at the Michael Reese Hospital in Chicago.

In the 1940s and 1950s the complications from treatment of premature infants began to be recognised. These included retrolental fibroplasia of prematurity, found to be the result of the use of excessive concentrations of oxygen in the incubators, and hearing problems, related to antibiotics administered to combact infection (Harrison, 1983). Despite these discoveries, there was little change in the care of premature infants until the 1960s, when neonatology became a recognised medical speciality (Bornstein, 1995). It was also at this time that new techniques for reducing the incidence and severity of the problems associated with prematurity were developed. These methods included techniques for assisted ventilation, equipment and laboratory tests to detect physiological problems, feeding methods and drugs. These specialised techniques and special equipment and the highly trained medical and nursing staff were expensive yet needed for only a few births, so the centralisation of management of high-risk infants was decided to reduce the cost. As a result, the different levels of neonatal care were developed.

1.7 **Levels of neonatal care**

In 1976 in the United States a Committee on Perinatal Health published a seminal document "Toward improving the outcome of pregnancy" (The National Foundation- March of Dimes, 1976). This document described a regional concept for reorganising perinatal services and issued recommendations for the development of three levels of nurseries. Since the 1970s, the regionalisation of perinatal and neonatal care in the United States has been instrumental in improving outcomes of the premature newborn, especially in increasing the neonatal survival rates. Level I hospitals were identified as hospitals that would provide care for "uncomplicated maternity and newborn cases." Level II hospitals would provide care for both uncomplicated and moderately complicated obstetric and newborn cases. Finally, Level III hospitals would be large or major regional centres which would provide leadership in education and research and act as coordinators of care for high-risk mothers and infants in the region (Gaynon and Cooke, 1993). With encouragement from pilot programs funded by The Robert Wood Johnson Foundation and from programs supported by the different States in America, perinatal regional care prospered during the 1970s. In an evaluation study of the introduction of regional centres of care sharp declines in neonatal mortality rates were identified. For example, for the period 1967-1974 a reduction in mortality by 43% was recorded in Quebec, Canada (McCormick et al., 1985). Thus, the developments of modern technology have facilitated increases in the healthy survival of many neonates who previously would have had little chance.

In Australia, the three levels of neonatal care have followed policies from overseas and facilities similarly provide services from Level I, suitable for uncomplicated cases to Level III for high-risk cases (Australian Health Ministers' Advisory Council, 1991).

Level I - These units provide services primarily for uncomplicated maternity and newborn patients, generally of healthy infants with gestational age greater than 35 weeks. These units are supported by Level III nursery for consultation, referral and transport for mothers and neonates who are identified as high-risk.

Level II – These units are generally located in the larger urban hospitals with obstetric services. The unit provides for complicated obstetric problems and neonatal illness. Facilities are available to provide care for neonates who are moderately ill. Admissions consist of sick neonates born in that hospital as well as those transferred from other Level I nurseries. Appropriate facilities and the availability of obstetric and paediatric consultants allow a Level II unit to assume the responsibility for the care of most neonates who do not require complex equipment, such as respirator and major personnel, referring only those cases of a complex nature to a Level III centre. Infants admitted to a Level II unit are generally of more than 32 weeks gestation and over 1500g at birth. According to the Standing Committee on Perinatal Medicine of the Australian College of Paediatrics (Australian Health Ministers' Advisiory Council, 1991) indications for admission to a Level II neonatal nursery include:

. transient problems requiring observation

. requirement for oxygen concentrations up to 40%

. need for parenteral fluid therapy including arterial catherisation

. short term assisted ventilation

. convalescing infants following acute illness

Level III – These units are situated in major general, maternity or childrens' hospitals associated with universities. These units provide neonatal care at three levels – normal, special and intensive care. Most level III units have obstetric services and not only take responsibility for the management of normal pregnancies in their immediate area, but also accept a high proportion of the high-risk pregnancies referred in from the region or state. Most neonates admitted to Level III neonatal intensive care units require, or are likely to require, assisted ventilation. The majority of these infants are of very low birth weight. Some infants who require assistance have developed respiratory distress not in association with very low birth weight. Most of the infants in this group will also have a significant degree of prematurity. The salient features of a Level III unit are the availability of continuous assisted ventilation, staff ratios related to the need for constant observation and monitoring of a neonate in a critical stage, and the availability of backup facilities in terms of consultants and sophisticated technology.

Indications for admission to a Level III neonatal intensive care units according to the Standing Committee on Perinatal Medicine of the Australian College of Paediatrics are the:

. need for sustained assisted ventilation, either mechanical or continuous positive airway pressure

. need for cardio-respiratory monitoring for recurrent apnoea or seizures

. cases of extreme illness e.g. sepsis

. need for parenteral nutrition

. need for long term oxygen administration

1.8 **Change in the attitudes of health care professionals caring for parents of premature infants**

Before the 1970s, the parents of premature infants were thought to be potential and actual carriers of organisms. To reduce infection of the premature infants these parents were allowed limited access to their baby which resulted in reduction of the parents' involvement in the care of their child (Bornstein, 1995). After 1970s, one of the most dramatic changes occurred in the attitude toward parents and families of premature infants.

A study from Stanford University Medical Centre was to change the hospital policy of separating parents from their infants to one of allowing parents into the nursery. In the early 1970s, Stanford University Medical Centre reported the rates of infection of premature infants compared in two time periods, the period when parents were not allowed into the neonatal intensive care units (NICUs) and during the period when parents were allowed into the NICUs and found no differences in the infection rates (Barnett et al., 1970). A replication of the study at Case Western Reserve Medical Centre in Cleveland produced similar results (Kennell et al., 1975). Barnett and colleagues (1970) also reported that there was a difference between mothers not allowed into the units and those allowed in. Those mothers who were allowed into the units showed increased commitment to their infants and more confidence in their mothering abilities and skills.

As a result of these findings, hospital practices shifted toward allowing parents unrestricted visits into NICU and encouraging parental involvement in the infant's care. Yu and colleagues (1981) surveyed 20 sets of parents whose infants had remained 10 days or longer in the NICU at Queen Victoria Medical Centre, Melbourne, Australia to determine the parents' reactions to unrestricted contact with their infants. They found both parents chose to maintain a high level of involvement such as changing nappies and bed linen for their infants. All parents felt more reassured with repeated visits, and most believed their infants also felt more loved and secure with the increased contact. However, despite more open access to NICUs and improved communication, studies during the past decade (Affleck et al., 1991; Padden and Glenn, 1997). still indicate that parents of premature infants in NICUs experienced high stress.

1.9 **Summary**

Before 1960 prematurity was defined as the birth of an infant weighing 2500g or less because birth weight was the most frequently and reliably recorded measure of infants, and was used to identify newborn infants for potential risk of mortality and morbidity. However, it was observed that not all infants weighing 2500g or less required the same level of care and the American Academy of Paediatrics in 1967 recommended that all newborns be classified by birth weight, gestational age and intrauterine growth indicators.

Bataglia and Lubchenco (1967) established criteria that set the separation between premature and term infants. From their work, six categories emerged: three according to intrauterine growth pattern (small-for-gestational-age, appropriate-for- gestational-age, and large-for gestational age) and three by gestational age (premature, term, and postmature).

Significant medical, technological advances and the regionalisation of neonatal care have markedly increased the survival rates of premature infants. Thus studies began to focus on the parents' experiences of having premature infants in a NICU and the impact the premature birth may have on these parents.

The next chapter discusses the transition to parenthood, the impact of premature birth on the parents and the literature reviews of parents of premature infants experiences in neonatal intensive care units.

Chapter 2 Transition to parenthood **Page**

Chapter 2

Transition to parenthood

2. Introduction

It is difficult to define the concept of parenthood. With the complexity of today's society and the many different life-styles, the term parenthood has been expanded (Hamner and Turner, 1996). In the past, parenthood meant that a person was responsible for biologically giving birth to a baby, however, today many kinds of individuals can be called parents (e.g. adoptive parents, foster parents) (Hamner and Turner, 1996).

Parenthood is one of the most frequently experienced life transitions in our society and for most people, this event is part of a normal life course. However, even this normative event is not easy for any new parent and is a challenge that is influenced by multiple factors, such as parental age, length of relationship, previous experience with children, role adjustment, availability of social support, the value and expectation parents place on the infant, and individual coping patterns (Kenner, 1995).

According to Mercer (1981), the development of the new role of parent is a staged process occurring over a period of one year. The perinatal period is the time for reflection and expectant parents develop certain attitudes and anticipations of what it will be like to care for the new baby.

It is also a time to reflect on their relationships with their own parents, relatives and friends.

As the time of the birth draws nearer, both mothers and fathers often become anxious and wonder whether they will be able to provide care for the new baby. Sammon and Lewis (1985) identified these periods as times of “change and confusion”. It has been widely recognised that the transition to parenthood is a time of dynamic change in the family system. Kalmuss and colleagues (1992) found that 25% of new mothers experienced a difficult transition to parenthood and that 65% of the new mothers reported experiencing some form of stress. Although transition to parenthood is an expected developmental event for most people, studies have shown that other personal and marital stresses increase after the first baby is born (Aldous, 1978; Miller and Sollie, 1980).

Since the 1950s studies have been carried out on the transition from being a couple to becoming a family. The most controversial study was by LeMasters (1957) who claimed that this normative transition of couple to family, typically seen as a time of joy, could constitute “moderate or severe crisis” in the marriage and family life in the first years following the birth of their first child.

Cowan and Cowan (1995) proposed a five-dimensional model to assess the couple’s transition to parenthood taking into account the importance of considering the broader social and relationship influences as well as individual psychological influences. These domains are: (1) the relationships of each individual in the new family; (2) the partner/marital relationship including division of labour; (3) the quality of relationship of mother and father with the child; (4) the balance between the two families of origin and the new family; and (5) the balance between each parent's sources of stress and the availability of social support.

2.1 **Common stressors of new parents**

The common issues that new mothers and fathers encounter are : (1) division of domestic labour, (2) issues of the marital relationship, and (3) financial worries.

2.11 Division of labour

Many new mothers and fathers agree that the division of labour is the major stress of the transition to parenthood (Belsky and Kelly, 1994) while they expect the baby to create a lot more work, that expectation does not adequately prepare them for what they actually encounter. One of the major changes that has occurred with the transition to parenthood over the past fifteen years is the way women view this division of labour. A combination of factors such as maternal employment, feminist ideology, and egalitarianism has made the woman of today expect and feel entitled to a significant amount of help from the man (Belsky and

Kelly, 1994). What was acceptable for earlier generations of new mothers is not acceptable for new mothers of this generation.

The men of today have also been affected by the change and they want to be more involved with home and child (Belsky and Kelly, 1994). In North America, for the past two decades there have been a shift in the ways in which fathers participate in families. The fathers are participating more in child care (O'Connell, 1993). This may be partly due to the feminist movement, both parents being employed and the motivation of men to be more involved in the care of their children. In America, by 1991, one of every five preschool children was cared for by their fathers while their mothers went to work. Research findings have suggested that many fathers want to increase the amount of time spent with their children (Schroepfer, 1991), and feel the fathering role to be more important then their work role (Simon, 1992). Even though, the proportion of total household tasks and child care performed by the fathers is increasing (Presser, 1988), it is still small compared to the mothers' burden (Darling-Fisher and Tiedje, 1990). Cowan and colleagues (1991) found that women assumed greater responsibility for household tasks and care of the child and both husbands and wives reported that the division of family labour was the issue most likely to cause arguments between them.

However, men perceive the division of labour differently from women and use a different yardstick to measure their contribution to the division of labour. He usually measures his contribution to chores against what his father did but a woman measures what her husband does against what she does. Also, the man's perception of who does what is influenced by the fact that he is, traditionally, the family's sole breadwinner and because this is the role he has been taught to equate with parenting, fulfilling the role makes the new father feel that he has already met his parental obligations (Belsky and Kelly, 1994).

2.12 Declining marital relationship

Declining marital relationship has been documented in several studies of new families after the arrival of a child or two. Two explanations have been proposed to account for the decline in new parents' levels of marital quality (Cowan et al., 1985). The first possibility is that the presence of the child limits the extent to which the couple can spend time with each other, presumed to be a factor that affects the level of marital intimacy and subsequent ratings of satisfaction (Glenn and Weaver, 1978). However, Cowan and colleagues (1991) found that babies have an impact on the lives of new parents, but it is the state of the couple relationship before the birth of the first child that contributes much more to the couple's adaptation to parenthood. The second explanation may be the role inequity and the decreased joint-activities can account for the decline in marital quality that occurs after the birth of the first child (Rossi, 1968). Belsky and colleagues (1986) reported that an increase in the woman’s household tasks was associated with a decline in their levels of marital quality through the transition to parenthood. For many, the transition to parenthood has consistently been associated with family stress, and in particular, stress in the couple's relationship (Mercer, 1990).

This may be due to the fact that the transition to parenthood for the first time highlights individual differences and thereby increases their level of marital dissatisfaction (Cowan and Cowan, 1988). Several studies have identified decline in the couple relationship during the first postnatal year, at both four and eight months following birth when compared to pregnancy and shortly after the birth (Mercer et al., 1987). This decline in the relationship can continue up to the first two or three years following the birth (Wallace and Gotlib, 1990). Terry and colleagues (1991) studied 59 Australian couples to examine the changes in marital quality across the transition to parenthood. The 32-item Dyadic Adjustment Scale was used to assess marital quality. They found that scores on the affectional expression subscale was lower for both new mothers and fathers at three months after the birth of the child. The decline in mothers’ levels of marital quality was evident only for those who were dissatisfied with their partner’s role performance postnatally. However, those mothers who were satisfied with their partner’s role performance of household tasks reported increased satisfaction with marital quality across the transition to parenthood.

The fatigue of the new mother and the attention and affection that she directs to the new baby may also be responsible for the declining marital relationship (Belsky and Kelly, 1994). Some men blame the marital problems on the maternal preoccupation with the baby which leaves them feeling unimportant and isolated.

2.13 Financial worries

Financial worries have been reported in studies on transition to parenthood. Financial strain reduces the parents’ levels of freedom to consider reducing the number of hours of employment for both parents. Another reason is that parents with more disposable income are likely to buy services that help to reduce the amount of family work that has to be divided among the partners (Wicki 1999), so that high satisfaction with financial resources is related to less parenting strain. Wicki (1999) studied 164 couples in Switzerland on the impact of family resources and satisfaction with division of labour on coping and worries after the birth of the first child. She found that the mothers’ perception of family resources and their worries were both affected by the couples’ satisfaction with the division of labour, which in turn was related to the perception of financial resources. This finding is in line with other studies demonstrating negative effects of economic pressure on psychological wellbeing and on the quality of parenting among two-parent families and single mothers of school children (Simons et al., 1993a; Simons et al., 1993b). The study by Barclay and Lupton (1999) showed that contemporary western society requires father to be a household helper as well as a provider. Thus, it is not suprising that the father is concerned with financial security such as conserving and enhancing financial resources (Belsky and Kelly, 1994).

2.2 **Gender differences in transition to parenthood**

Men and women experience the transition to parenthood differently. In the weeks and months immediately following the baby's birth, many women suffer from fatigue and exhaustion (Woollett and Parr, 1997), and some become significantly depressed. Thompson (2000) reported that a study of 1,300 Australian women eight weeks after birth found 60 percent experienced exhaustion. Several studies suggest that new mothers may also suffer from anxiety, depression and low self-esteem (Belsky and Kelly, 1994). To some extent these two phenomena of fatigue and depression are related as fatigue creates a vulnerability to unpredictable mood swings and vice versa. The new mother also worries about her parenting skills and wonders whether she is capable of giving the baby the care and love he/she needs. Another common feature of the mother's transition is about her physical changes after the birth of the baby. A University of Minnesota study indicated that when a new mother is not worrying about her fatigue or parental competence, she is worrying about her physical changes (Belsky and Kelly, 1994). Woollett and Parr (1997) reported a study of couples' transition to parenthood and found that women's accounts of childbirth included pain and discomfort after delivery and also concerns about their body's physical recovery.

Research on the father's transition to parenthood is limited. Studies on parent-infant interactions have focused on the mother-child relationship and have neglected to include the father as an important member in this relationship. It has only been in the past years that the importance of the new father has been addressed. The transition for most new fathers is a difficult one (Hangsleben, 1983). Henderson and Brouse (1991) studied the experiences of new fathers during the first 3 weeks of the birth of their infants. They found that the new fathers experienced to a greater or lesser degree a three-stage process. Stage I involved the preconceptions about how it would be being a father, stage II coming to grasp the reality of being a father and stage III is overcoming the overwhelming feelings of being a father and becoming more involved in the care of the infant.

The father's transition to parenthood is not free of upheaval either but there are fewer highs and lows documented. While a new mother's stress levels continue to rise through out the first year after the birth of the baby, the new father's stress levelled off after the first month (Belsky and Kelly, 1994). There is some evidence that new fathers may worry even more than new mothers about work, money, in-laws, chores and what their wives are enduring. In a survey, 70 % of new fathers reported that it took them weeks and months to form an attachment with their babies (Belsky and Kelly, 1994) where as many mothers found it hard to remove themselves from their babies from the day of birth. However, Woollett and Parr (1997) reported that 98% percent of men had a good relationship with their babies.

Barclay and Lupton (1999) reported a study on 15 new Australian fathers. The fathers were interviewed on four occasions during the period from just before the birth of their child and five or six months following the birth. The investigators identified several interrelated themes that shape the experiences of first time fatherhood. First, the men and their partners differed in how they defined work and also how they saw household tasks and infant care. The men tended to see their paid employment as holding a status above that of caring for their infant or their contribution to domestic work. They also considered it necessary to pursue their hobbies during the weekend as essential for their relaxation. However those men who were involved in the caring of their infants found emotional satisfaction. The second theme was the expectations and symbolic meanings of fatherhood. Most first-time fathers were unrealistic with their expectations. They expected that their involvement with their child would be reciprocal and did not expect their child to be non-social and demanding. The third theme was the changing relationship with their partner. It appeared that things usually go wrong during the second or third week after the birth of the baby. That is after the men returned to their paid employment and the partner was left alone all day to do the household tasks and care for the baby. Barclay and colleagues (1996) reported that in Australian society, men are not well prepared for their household and parenting roles and found the contemporary experience of new fatherhood disappointing.

During the transition to parenthood mothers and fathers have different priorities and needs (Belsky and Kelly, 1994). The chief priority of the mother is an equitable division of labour. The new mother wants a husband who will respond to her fatigue by taking an active role in the chores of the home and baby and who will sit and listen when she wants to talk about her anxieties and frustration. However, the chief priority for men is work and most men are brought up to believe that ensuring a family's financial security is the prime responsibility of the husband. Even in today's egalitarian society this belief continues and some new fathers begin to work longer hours or holding down two jobs to cover the income gap left by the mother's loss of income. Also, most of the fathers continue to want to have what they had before the birth of the baby. This includes affection from his wife, and some social life and freedom to pursue his hobbies and sports.

2.3 **Factors influencing the parental role**

Research into family and social systems models has identified a number of factors that contribute to the parents' (both mothers and fathers) success in developing and integrating new family roles. These factors are marital quality and equality, parental personality characteristics, and social network support (Belsky, 1986; Power and Parke, 1984). Another factor that may be important in understanding couples' adjustment during the transition to parenthood is the quality of the parenting experiences in one's own family of origin. Belsky and Isabella (1985) examined the relationship between current marital functioning and rearing experiences in one's family of origin. The findings of this study indicated that poor rearing (e.g. abuse or neglect) and/or poor parental marital relationship may increase the likelihood of negative changes in the marriage. The parents' (both mother and father) feeling and behaviour towards their baby are deeply influenced by their previous personal experiences, especially those they have had and may still be having with their own parents (Kenner, 1995). Another factor is the role played by the infant's characteristics. Hamner and Turner (1996) and Woollett and Parr (1997) suggested that parents were more likely to report positive experiences of parenting if their infants were easy to care for (i.e. having easy temperaments) and negative parenting was likely if their infants were difficult to soothe, or fractious. Thus, it is likely that certain infant characteristics may influence how quickly some new mothers and fathers adjust to parenthood.

In Australia, Oberklaid and colleagues (1991) found no difference in the temperament of preterm and term infants at 4 to 8 months of age using the Infant Temperament Questionnaire. In this study, 63% of the preterm infants were born greater than 33 weeks with no medical complications. Thus, the sample consisted of low-risk infants. Langkamp and colleagues (1998) compared the temperament of preterm infants born at 34 weeks or earlier with that of healthy term infants at 4 months of age using the Early Infant Temperament Questionnaire. They found that preterm infants had more difficult temperament than term infants. The preterm infants were recruited into the study when they had been in NICU for at least 14 days. Therefore, the differences in findings between these two studies may be due to the different characteristics of the samples and also the different instrument used for the assessments, rather than any inherent temperament differences. Studies have shown that mothers of infants with colic had psychological distress such as anxiety, fatigue, depression and hostility (Pinyerd, 1992; St. James-Roberts et al., 1996) and rated themselves as less competent than mothers of infants who did not have colic (Stifter and Bono, 1998).

There were limitations on the studies on transition to parenthood. Most of the studies had small sample sizes (Belsky and Isabella, 1985; Wallace and Gotlib, 1990; Barclay et al., 1996). Some of the samples in the studies were very selective (Kalmuss et al., 1992; Belsky et al., 1986) and were by no means representative of the population at large. Therefore it is important to consider these sample characteristics when comparing findings.

2.4 **Tasks of transition to motherhood**

During pregnancy, birth, and postnatally, Rubin (1984) suggests that a woman undergoes a cognitive mapping of the " I " (the maternal identity) in relation to the "you" (the fetus/neonate). She believes that the level of the development of the maternal identity is directly related to and dependent on the development of the child. She describes the first trimester of pregnancy as a time when the "someday" of childbearing has become a reality. The second trimester is the time of the attachment process when the woman experiences the first fetal movements. The infant who is born at this time (e.g. premature infant) has yet to develop into the "ideal conception" of a full term newborn, and the mother still perceives herself as a pregnant woman rather than as a mother. During the third trimester, the mapping of the maternal identity is complete with the birth of the infant. Thus, the woman whose maternal identity is interrupted by giving birth to a premature infant especially during the second trimester, will mourn the loss of the "ideal" infant. During the postnatal period, mothers continue to expand their maternal identity in relation to the infant's growth and this may be difficult as a premature infant differs from the full term infant in appearance and behaviour.

The characteristics of premature infants have been described by Schreiner (1988) and O'Brien and colleagues (1995). The premature infant may look funny to the parents, due to the difference in weight and proportion. The head of the premature infant looks large and the body scrawny and the length of the trunk in proportion to the limbs are relatively increased compared with the term infant. The skin of premature infants appears ruddy because of its transluence and the lack of fat layer between the skin and the blood vessels. This lack of a fatty layer makes the infant appear wrinkled. Many premature infants less than 32 week's gestation have poor muscle tone and the legs are floppy and extended. This hypotonicity and combined immature central nervous system means that the premature infants have little control over their movements and they startle easily and their limbs may tremble. Therefore parents are often frightened when they see these movements. The differences in activity and neurological responses are also apparent in the immature infant, as the premature infants have a low level of alertness and spontaneous activity. The greater the immaturity of the infant the less general activity he/she shows.

So it is understandable that the appearance and behaviours of the premature infant may contribute to the parents' perceived loss of a healthy term infant. Also, it is common for parents of a healthy, term infant to be allowed time alone with their newborn immediately after the delivery. The birth of a premature infant deprives both the parents of these early contact experiences. The premature infant is taken immediately to the special care nursery and in some cases transferred away to a tertiary centre for intensive care.

2.5 **Premature birth and parental reactions**

2.51 Parent reactions to premature infants

During pregnancy, the parents spend much time imagining what the infant will look like and dreaming about the joys of parenting (Berns et al., 1993). Giving birth during the second trimester results in the loss of opportunities to prepare mentally for motherhood (Rubin, 1984). A premature birth cuts the pregnancy short and the parents are usually unprepared for such an untimely event. The birth of a premature infant is a significant stressful event for the parents and the family (Boardman, 1995; O'Brien et al., 1995). Even though the factors that affect parental stress levels are varied, they include situational factors, the infant's medical status, familial factors, the quality of the marital relationship and past coping strategies of the parents (Boardman, 1995).

(i) situational factors include the mother's physical state. Mothers of premature infants must cope with their own physical recovery after the birth of the infant. The lack of sleep in the hospital may be due to the presence of other women and their babies and the hospital routine may contribute to the fatigue state of the mothers; (ii) factors related to an infant's medical status can influence parental stress levels. These include the infant's gestational age, birthweight, and length of hospitalisation in the neonatal intensive care unit (Affleck et al., 1989a). The earlier the gestational age and the lower the birthweight the longer the length of hospital stay for the infant. Also seeing their infant on a respirator, attached to numerous monitoring equipments and being fed through tubes or intravenous infusion are major sources of anxiety for parents (McCluskey-Fawett et al., 1992); (iii) Familial and cultural factors play a part in the parents' ability to cope with the stress of premature birth. Often there are celebrations, homecomings, and gifts accompanying the birth of a normal, healthy term infant. However, these are absent with the birth of a premature infant and especially so if the survival of the infant is uncertain (Gorski, 1984). The culture in which the parents have been raised and live also have an impact on how the birth of a premature infant is reacted to; (iv) marital relationships can affect the stress level of the parents and their ability to cope with the birth of a premature infant.

First time parents have new responsibilities and the birth of a premature infant compounds these challenges. The parents' ability to support each other in this time can greatly reduce the stress. Neonatal intensive care unit (NICU) care is costly for the parents and therefore financial factors may play a part in increasing the stress of the parents; (v) Coping strategies used and the abilities to deal with previous stressful situations may predict how parents may cope with the current stressful situation. A popular concept assumes that an individual uses the same coping strategies across all different stressful situations because the personal characteristics of the individual are relatively immutable attributes that are expected to operate in the same way on numerous occasions and which lead to the same coping responses (Moos, 1974). Conversely, other researchers (e.g. Parkes, 1986; Carver et al., 1989) do not support this notion. Rather, coping strategies may be situation-specific.

Parents of premature infants understandably undergo a period of grieving. Parents grieve for their loss of their “ideal infant,” and tend to pass through different stages similar to those of other grief reactions. Parents who have infants in the neonatal intensive care unit go through a period of initial overwhelming shock and disappointment, followed by feelings of failure, and accompanying feelings of panic, anxiety and helplessness (Siegel et al., 1993; Vergara, 1993). Parents may experience feelings of guilt for the premature birth, as though they were responsible for the outcome of the pregnancy (Callahan et al., 1983). Apart from blaming themselves for the premature birth, the parents may feel guilty over their inability to provide immediate care for their infant (Whettsell and Larrabee, 1988). The adaptation process may include an anticipatory grieving phase characterised by resignation, and preparing for the possibility that their child might die. Whether or not a basis for guilt can be identified, many parents feel responsible for their infant's condition so that self-blame often characterises these feelings, either for something they did or else did not do (Berns et al., 1993).

2.52 Use of psychological defences

Parents may try to mentally avoid acknowledging the situation by denial, which is a recognised way of coping with the emotional effects of shock (Moore, 1981). Easterbrooks (1988) has also reported in an unrefereed book chapter, that denial is also a common early response by parents of premature infants. Tracey (2000) interviewed six mothers and fathers of preterm infants of less than 33 weeks gestation separately for 18 times over the first four months of their infant's life. The parents were recruited from an inner city hospital neonatal intensive care unit in Sydney, Australia. A group of professionals working with parents and infants met regularly to review the interview materials and found that parents used denial as a defensive strategy to cope with the stressful event (Tracey et al., 2000 a, b). Although there is a limitation to the study because of the small sample size, it demonstrated that some parents used denial as one of their coping strategies. Intense feelings of resentment and anger usually follow denial as parents often displace their feelings in order not to experience other emotional states like high levels of anxiety and/or depression. Parents may direct these feelings at themselves, the infant, members of the health care team, their God, or even at each other as parents.

The parents of premature infants also feel a sense of isolation from other couples who have had a normal pregnancy or infant and they may even experience feelings of isolation from each other (Berns et al., 1993). There is not only mourning for the loss of the perfect child that was expected but also anticipatory grief for the infant whose life now may be in jeopardy (Mahan et al., 1982) as the parents anticipate the possibility of death of their infant. Thus, they may avoid emotional involvement with the infant to protect themselves from the potential pain of loss. These feelings may be projected by rejection of and distancing from their infant. Some parents may delay in naming or delay in visiting the infant as they fear that they may lose their infant. So by not seeing the child they subconsciously try to protect themselves by reducing opportunities for attachment.

2.6 **Parent-Infant attachment**

The concept of attachment is often confused with love and bonding (Goulet et al., 1998). The origins of the term ‘attachment’ date back to the 13th century, but it was in the 18th century that a French philosopher named Rousseau (Goulet et al., 1998) first used the concept in relation to the mother-infant relationship. Klaus and Kennell (1976) also focused on the mother’s perspective of the attachment relationship. The origin of attachment has also been described as cue sensitivity in which parents learn to recognise their infant’s characteristics (e.g. temperament), to communicate with their infant, and develop love for it (Stainton, 1990).

According to Bowlby's (1982) theory, attachment refers to the child’s tie with the mother figure. The degree of security of a baby’s attachment to its parents can have a significant impact on the child's social development, cognitive growth and emotional well-being (Peterson, 1989). Attachment is an interactional process that begins with an initial acquaintance stage, gradually developing towards attachment (Lobar and Phillips, 1992). According to these authors, acquaintance is the basis of all human relations and is the first step towards attachment.

The process of attachment between parents and their infant is unique in that it begins before the infant is born (Moore, 1981). It starts to develop early in pregnancy, appears to increase when fetal movements are felt, and intensifies when the infant is born and the parents are able to see, touch and care for their infant (Korones, 1986). Rubin (1984) insisted that maternal attachment to the infant begins during pregnancy, extending through the six months following birth. She identified attachment in the prenatal phase as the first stage of the attachment process that continues into the postnatal period. Parent-infant attachment appears to be facilitated by early and frequent contact. However, with the birth of a premature infant the normal attachment process is abruptly interrupted. The long-awaited physical contact with the newborn, the anticipated interaction, and the provision of nurturing care are all delayed. Parental anxiety and depression have been identified as significant inhibiting factors in parent-infant interactions that consequently interfere with parent-infant attachment (Mercer and Ferketich, 1990). Since the birth of a premature infant creates a sense of loss, attachment cannot be achieved totally until the parents have resolved their grief reactions and anxieties.

Within the context of the neonatal intensive care/special care nursery (NICU/SCN), there is a potential for delay in the parent-infant attachment process. Attachment is a complex human experience that requires early physical contact and in the NICU/SCN environment the focus of care is the infant, based on essential technology (e.g. presence of monitoring equipment) and procedures (e.g. routine cranial ultrasound) do not promote an environment conducive to parent-infant interactions. Bialoskurski and colleagues (1999) interviewed 25 mothers before their infants were discharged from NICU to study the phenomenon of attachment in NICU. The findings indicated that the process of attachment was not automatic but should be considered as a process that proceeds in a highly individualised way.

Bialoskurski and colleagues (1999) identified three attachment processes. *The immediate attachment process* occurs when the mother's feelings are positive toward the infant. This is more likely to occur if the mother is able to see the infant immediately after birth and when the physical contact occurs between the mother and the infant. When the infant is premature *the delayed attachment process* may occur as the infant's appearance and behaviours do not conform to maternal expectations. If there is a break up of a relationship between the partners, or when the infant is born handicapped or premature, t*he problematic attachment process* may occur, making attachment a problematic process for the mother and the father.

Hagan and colleagues (1996) discussed the determinants of post-traumatic symptoms and attachment amongst parents of preterm infants. In this study, mothers and fathers were grouped according to their infants' gestational age, as parents of : (i) very preterm infants (<32 weeks' gestation), (ii) moderately preterm infants (32-36 weeks' gestation), (iii) healthy term infants (>37 weeks' gestation). During the first postnatal week greater psychological distress was experienced by both mothers and fathers of the very and moderately preterm infants. Furthermore, it was found that 56% of mothers of very premature infants and 11% of moderately premature infants were likely to be clinically depressed during the first postnatal week as identified by the Edinburgh Postnatal Depression Scale. However, after two months in the postnatal period, significant improvements in the level of parental psychological distress and feelings of attachment were apparent in parents of both the very and moderately preterm infants although they failed to reach the levels reported by parents of healthy term infants. The factors which significantly mediated mood and feelings of attachment in mothers included satisfaction with received social support and the application of emotion-directed coping strategies. For fathers, the mediating factors were satisfaction with social support, and the utilisation of both emotion- and problem-focused coping strategies.

2.7 **Literature review of parental reactions to a premature infant**

The literature review for this thesis was scanned from the Ovid technologies program for a formal search of MEDLINE (Index Mediccus ON LINE), CINAHL (Cumulative Index to Nursing & Allied Health), and PsycINFO (Psychology Association of America) between 1960-2000. Some of the text terms used for the search were "parents preterm/premature infants", "emotions", "stress", "anxiety", "depression", "coping", "social support", "parenthood", "NICU", and "SCN". The search results were linked to "Human" and "English Language". The search was restricted to English Language because of the cost involved in employing an interpreter and this may be the limitation of the review. Cross-references were also utilised. Well-known textbooks from the field of perinatology and neonatology were used as source texts and specialist journals focusing in the field of neonatology and pediatrics such as the

Neonatal Network, Journal of Neonatal Nursing, and Journal of Pediatrics were included in the review. The Cochrane review for “parental stress in NICU” was attempted but it produced no result.

A literature review (Lau and Morse, 1998) from 1960s to 1990s of the experience of parents with premature infants hospitalised in neonatal intensive care units showed that delivery of a premature infant and admission to NICU represents a stressful time for the parents. As early as 1960s, a study was carried out on mothers of premature infants by the Harvard School of Public Health Family Guidance Centre. Sixty mothers were interviewed during the period following the premature birth and when the baby had been home for two months (Kaplan and Mason, 1960; Caplan et al., 1965). They found that mothers experienced a range of negative emotions including worry, disappointment, and a sense of failure of not having a full term infant. They identified that mothers needed to successfully accomplish four psychological tasks in order to have a sound basis for a future healthy parent-child relationship. The four tasks were: (i) preparing for the possible loss of the infant, (ii) acknowledging her feelings of failure due to not delivery a normal full term infant, (iii) resuming the process of relating to her infant, and (iv) understanding how a premature infant differs from a normal full term infant in terms of special needs and growth and that these needs are temporary.

With recent advances in technology and in medical and nursing care, the survival rates of VLBW premature infants have increased in the past years (Blackburn, 1982; Miles et al., 1999). Contemporary research studies have been increasingly directed towards the parents' experiences of having these premature infants in the NICU environment rather than simply examining the factors surrounding the infant's survival. Blackburn and Lowen (1986) studied the impact of premature birth and the subsequent hospitalisation of the infants on 36 mothers and 14 fathers. They found that the mothers of premature infants experienced feelings of guilt, disappointment, helplessness and a lack of control over the situation more than the fathers. Gennaro (1988) examined differences in anxiety and depression in 41 mothers of term and premature infants in the first postnatal week and then over the next six weeks. She found that the mothers of premature infants were more anxious and depressed than mothers of term infants in the first postnatal week but these differences did not persist over time and disappeared by the second postnatal week.

However, it was interesting to note in the study that although it was not significant, the mothers of term infants were anxious at week four and mothers of premature infants at week five. It was posulated that the anxiety may be due to the decrease in social support. Family members who have come to help have departed at this time. The accumulative sleepless nights were beginning to have an impact and also the adjustments in roles have not yet been worked out.

Gennaro and colleagues (1990) compared two psychological stress responses, anxiety and depression, in 27 mothers of very low birth weight preterm infants compared with 35 mothers of low birth weight preterm infants from the time of the infants' birth until the infants reached five months adjusted gestational age. For both groups of mothers of VLBW and LBW infants, the week after delivery was the time of greatest anxiety. Mothers of VLBW infants experienced higher anxiety and depression until the infants reached two months adjusted gestational age, while mothers of LBW infants experienced higher anxiety and depression at three and four months adjusted gestational age. They postulated that the difference may be in the chronological time it takes VLBW infants and LBW infants to reach an adjusted age where they are becoming more responsive and achieving their developmental milestones.

Beckman and Pokorni (1988) interviewed 44 mothers of preterm infants at 3, 6, 12, and 24 months to determine if there were changes in stress over time. They found that mothers' stress experiences change over time; however, these changes in stress were specific to the child-related problems. The number of child-related problems decreased over the two years of the study leading to a decrease in maternal stress. Stjernqvist

(1996) followed 20 families of extremely low birth weight, (ELBW < 901 gm) and 20 fullterm matched controls up to one and four years to evaluate the impact of the birth on the family. She reported that during the first year the ELBW infants were more demanding compared to fullterm infants because of the increased rates of feeding difficulties and restlessness in the ELBW infants. The parents reported higher levels of physical symptoms of headache, abdominal pains, extreme tiredness and marital dissatisfaction. However, at the four year follow up, even though the ELBW children were still more demanding of their parents, the families had adapted to the situation and the psychosomatic symptoms had subsided.

Singer and colleagues (1999) determined the degree and type of stress experienced over time by mothers whose infants vary in degree of prematurity and medical and developmental risk. The three groups of infants were high-risk VLBW infants diagnosed as having broncho-pulmonary dysplasia, low-risk VLBW infants without bronchopulmonary dysplasia, and term infants (> 36 weeks, birth weight > 2500g). The infants were matched on race and socioeconomic status and born during the same period.

Mothers completed the standardised self-report measures of The Brief Symptom Inventory, The Parenting Stress Index, The Impact on Family

Scale, The Family Inventory of Life Events and Changes at 1, 8, and 12 months and 2 and 3 years (ages corrected for prematurity). At eight months and each subsequent visit, all infants were assessed for cognitive development using the Bayley Scales of Infant Development. During the three years study, mothers of high-risk VLBW infants reported higher levels of anxiety, obsessive-compulsive behaviours and depression than mothers of low-risk and term infants. At two years, mothers of low-risk VLBW infants psychological distress did not differ from term infants. By three years, mothers of high-risk VLBW children did not differ from mothers of term children in distress symptoms, while parenting stress remained greater. Severity of maternal depression was related to lower child developmental outcomes in both VLBW infants.

In all these studies, the premature infants were admitted to a neonatal intensive care unit. However, only one study was cited that looked at the experiences of parents of infants admitted to a special care baby unit. Stewart (1989) surveyed parents' experiences whose infants were admitted to a special care baby unit (SCBU). The infants were preterm or term infants requiring intensive and/or special care. She identified a mixture of emotions. Parents were initially shocked and distressed with their infant's admission to the SCBU and these feelings were then replaced by further guilt and bewilderment.

The infants admitted to an intensive care unit are sicker than infants in a special care nursery. The atmosphere in the neonatal intensive care unit has an aura of emergency with its heat, noise, presence of critically ill newborns, high-tech biomedical equipment and the large number of health care professionals intensely preoccupied often overwhelm the parents.

Miles (1989) studied the effects of the NICU environmental stimuli on 53 parents and found that the highest stress was caused by the appearance and behaviour of the infants, followed by the distress the parents experienced from the delay in assuming the parental role, dissatisfaction and lack of interactions and communications with staff, and the distressing sights and sounds associated with the NICU environment. Perehudoff (1990) reported that the degree of stress perceived by mothers and fathers during the first week of their infant's NICU admission was relatively low. However, there were gender differences in perceiving the NICU environment as stressful. For mothers, the delayed parental role caused the highest stress, followed by the sights and sounds of the NICU environment, the infant's appearance and behaviours and staff communication and relations. For fathers, the sights and sounds of the NICU environment caused the highest stress followed by the delay in assuming the parental role, the infant's appearance and behaviours, and staff communications and relations. Raeside (1997) interviewed 12 mothers of infants in NICU with VLBW and LBW and found that mothers of VLBW reported higher stress levels than mothers of LBW. The highest stressor reported by the mothers was the heat intensity in NICU. Padden and Glenn (1997) interviewed 36 mothers whose infants were admitted to NICU and found that 25 of these mothers commented that the first sight of their infant in the NICU environment was extremely overwhelming, daunting and frightening. Due to the advances in technology and the presence of monitoring equipment in the SCN, there are now considerable similarities between the environment of NICU and SCN.

There were limitations to the studies on parental reactions to a preterm infant. The most common limitation is the small sample size (Blackburn and Lowen, 1986; Beckman and Pokorni, 1988; Raeside, 1997) which cannot be generalised to the population at large. Some of the questionnaires used were not evaluated for their reliabilities and validities (Blackburn and Lowen, 1986; Stewart, 1989). The analyses of the studies were also different making comparisons difficult (Miles, 1989; Perehudoff, 1990).

The literature review has shown that studies of stress experiences of parents of premature infants have been focused mostly on the mothers and carried out in the neonatal intensive care environment. No study has been done specifically on the experiences of these parents in the special care nursery environment.

It is clearly demonstrated in the literature review that studies on parents of preterm infants in the 1970s-1980s showed that parents were stressed with the birth of a preterm infant and that those studies tend to focus on the mothers. The studies of today tend to include the fathers. One of the major differences expected between the studies carried out in the 1970s-1980s and today is the attention given to sources of stress. The technological advances and the improved understanding of patho-physiology of neonatal problems have increased the survival rate of the preterm infants, especially the ELBW and VLBW infants. But these advances have had negative effects on the parents and their infants. The admission of a newborn infant to a NICU is a stressful event for parents compounded by the overall NICU environment (bright lights, loud noises, the complexity of the equipment surrounding their infant, the sight of other small and sick infants and the number of health care professionals working with the infants). The noise in the NICU has been linked to behavioural and physiological changes in preterm infants (Zahr and Balian, 1995; Zahr, 1998). The ambient noise levels in the NICU today are reduced by taking steps such as ensuring alarms of the monitors are controlled at minimally audible level, no tapping on the incubator, and lowered volume of the noise of nurses during handover period. Concerns about the light in NICU include the continuous exposure of the infants to high-intensity light and a variety of vision problems such as vision processing deficit as well as retinopathy of prematurity (Seiberth et al., 1994). The bright light can be reduced by the provision of individual cot side lamps, shading the infant's eyes with goggles or using incubator covers. Excessive handling of the infants had previously been shown to be associated with adverse physiological effects such as increased oxygen consumption, heart rate and respiratory rate (Evans, 1991; Zahr, 1998). Therefore health care professionals working in the area can help to minimise environmental stress for these parents and their infant's neurobehavioural systems by modifying the physical characteristics of the NICU and altering the pattern of caregiving activities.

2.8 **Parenting in neonatal intensive care nursery**

Certain factors affect the ability of the parents to acquire parenting skills during the NICU experience. Parents need time to grieve for the loss of an expected perfect infant before they are able to begin to attach to their ill infant (Berns et al., 1993). Mothers and fathers react to stress and grief in different ways (Berns et al., 1993). A father may become engrossed in his work and not share his feelings with the mother nor admit his feelings to himself. A father often tries to be strong for the mother and may become protective, shielding the mother from painful information. On the other hand, the mother may view the husband's stoic behaviour as cold and unfeeling. Both may have difficulty discussing the infant because of guilt feelings and usually high anxiety and distress and if the mother suffers from postnatal blues it will further reduce the parents' ability to come to term with the stressful situation.

When parents have an infant in a NICU, they have certain expectations (Gilbert and Harmon, 1986) of excellent medical and nursing care and accurate and timely information throughout the infant’s illness. However, it is important to realise that what the health care professionals think is important may not necessarily be what parents perceive as important. It is also not uncommon to have the mother and father receive quite different messages regarding their infant’s condition and progress from the hospital staff. Since parents of premature infants are frequently psychologically and emotionally overwhelmed immediately after the delivery, it may be necessary for staff to repeat essential information several times over before it is well understood by them. At the same time, the parents expect to be involved in decision-making about their infant 's care (Gilbert and Harmon, 1986). In the early stage of the infant’s hospitalisation, parents experience helplessness as they are forced into a passive role of becoming merely secondary caregivers, with minimal control over their infant. Boardman (1995) believes that parents should be involved in their infant’s management and care as early in the hospital course as possible. Early parental involvement has been shown to promote sound parent-infant attachment and helps to establish confidence in the parents in being able to care for their infant in the future, following discharge from the hospital.

2.9 **Summary**

The transition to parenthood has been associated with profound stress and is influenced by multiple factors, such as parental age, previous experience with children, marital relationship quality, parental personality characteristics and social network support. However, the stress is intensified if the birth is high-risk resulting in the birth of a premature infant.

In general, this body of research suggested that parents especially mothers of premature infants hospitalised in the NICU, experienced strong negative emotional affects. The most commonly reported responses were anxiety, helplessness, fear, uncertainty, and worry about the outcome of their infant. Other common responses reported by the mothers were sadness, guilt, shame, sense of failure and depression.

Many studies have been conducted on the experiences of parents of premature infants. These studies clearly demonstrate that the focus has been predominantly on premature infants in the neonatal intensive care nursery only. This indicates that there is a real need to study the experiences of parents of premature infants admitted to the special care nursery.

There has been a general consensus that parents of premature infants may experience anxiety and stress. Not only is the birth traumatic but the appearance and behaviour of their premature infant may cause mixed emotions, including feelings of rejection. The subsequent hospitalisation of their infant further contributes to the parental stress.

As there are some degree of similarities between the NICU and SCN environments, the proposed study will seek to: (a) determine the stress experiences of parents of premature infants admitted to SCN, (b) evaluate parental experiences in the Australian context, and (c) to examine the gender-based differential stress reactions in mothers and fathers with their infants while in the special care nursery.

The present study is the first study that examines the stress experiences of mothers and fathers with preterm infants in the special care nursery environment. In this study, the use of both self-report questionnaires and objective biochemical markers of stress are measured to identify the stress levels of these parents. As well, the study is a controlled comparison that examines the stress levels of parents of preterm infants in special care nursery with parents of healthy term infants in the post-natal ward of a tertiary maternity hospital.

To understand human responses to stress, the next chapter will explore the concept of stress and the physiological and psychological reactions of stress.

Chapter 3 **Concepts of stress** **Page**

Chapter 3

Concepts of stress

3. **Introduction**

The term ‘stress’ originated from the Latin words *strictus,* which means “tight,” or “narrow,” and *stringere,* which means “to tighten” (Smith, 1985). Stress is a concept that is difficult to define. Its interpretation has tended to vary as individual disciplines have used the word for their own specific purpose. Hinkle (1977), describing the evolution of the term stress, noted that around the 17th century it was commonly used to mean hardships, strain, adversity, or affliction; and in the 19th century when the term stress was used in the context of the physical sciences to describe the behaviour of elastic materials under pressure. In this context, the term stress was used to mean the ‘force, pressure, strain or strong effort exerted upon a material object or a person.’ During the 19th and the early 20th century the word came to be used as an analogue in the social and biological sciences to describe a possible cause of ill health and mental illness (Bartlett, 1998).

3.1 **Definition of stress**

The definition of stress has been described from three perspectives: (1) stimulus-based, (2) response-based, and (3) interaction-based (Bartlett, 1998).

3.11 Stimulus-based

A stimulus-based definition identifies stress as a stimulus emanating from the external environment which causes a strain reaction in the individual. This definition is encapsulated in the physical sciences and in physics, namely, when a load is applied to a substance it produces a force known as the 'strain' and the substance is said to be 'under stress'. In a similar way, a threat stimulus may set up a reaction in the individual called the strain and the individual may be said to be 'under stress' or experiencing stress.

3.12 Response-based

Hans Selye, a physiologist (1956) popularised a response-based definition when he defined stress as the non specific response of the body to any external demand and he referred to stress as a set of bodily responses against environmental demands regardless of the source of stress, referred to as stressors.

In 1974, Selye formulated a theory of stress reactions called the "General Adaptation Syndrome" (GAS) (see Table 3.1, p. 74). This referred to the body's responses as consisting of three stages: (1) alarm reaction, (2) resistance, and (3) exhaustion.

Table 3.1 <u>General Adaptation Syndrome</u>

Alarm stage
- Sympathetic nervous system arousal
- Adrenal medullary stimulation
- ACTH release
- Cortisol release
- Growth hormone release
- Prolactin release
- Increased thyroid activity
- Gonadotropin activity increased
- Anxiety

Resistance stage
- Reduction in adrenal cortical activity
- Reduction in sympathetic nervous system activity
- Homeostatic mechanisms maintained

Exhaustion stage
- Enlargement of lymphatic structures
- Target organ disease/dysfunction manifest
- Increased vulnerability to disease
- Psychological exhaustion: depression
- Physiological exhaustion: disease → death?

Adapted from Everly, G.S., 1989, p. 39

In the first of the three stages, alarm reaction occurs when an individual first recognises the existence of a threat, and the body is activated through both the sympathetic-adreno medullary system (SAM) and the hypothalamic-pituitary-adrenal cortical (HPAC) system resulting in outpourings of the catecholamines (adrenaline and noradrenaline) and glucocorticoids (cortisol and corticosterone). These biochemicals arouse the individual's systems to respond to the challenge in particular ways.

The SAM plays a role by increasing metabolic activity in response to situations experienced as stressful. The sympathetic nervous system (SNS) releases norepinephrine from sympathetic nerve terminals and both norepinephrine and epinephrine from the adrenal medulla.

Activation of the sympathetic nervous system increases the blood pressure, heart rate, cardiac output, and blood flow to the skeletal muscles and simultaneously decreases blood flow to the kidneys, gastrointestinal system and the skin (Everly, 1989). Thus, the organism is primed to either fight or flee from the threatening situation with the sympathetic nervous system (SNS) releasing noradrenaline from sympathetic nerve terminals and noradrenaline and adrenaline from the adrenal medulla. The SAM system responds first because of their transmission via the neurons. The HPAC system triggers the release of adrenocorticotropic hormone (ACTH) into the systemic circulation from the pituitary, which, in turn, is controlled by the secretion of hypothalamic ACTH-releasing hormone (CRH) (Guyton, 1991). ACTH stimulates the adrenal cortex to secrete the corticoids, mainly glucocorticoids, such as cortisol and corticosterone. Cortisol converts amino acids to glucogen, mobilises free fatty acids from the body's stores of adipose tissue, breaks down protein, increases arterial blood pressure and decreases the release of lymphocytes from the thymus gland and lymph nodes (Greenberg, 1990). As stressors continue to exert effects, the individual may progress into the second stage of the GAS termed the stage of resistance. During this stage, physiological changes that occurred during the first phase cease and the individual's tolerance to stress is increased, the stage of 'adaptation'. If the stress continues over a substantial period, the individual may enter the third stage of GAS referred to as the stage of exhaustion. During this stage, the individual reaches a state in which he or she can no longer respond either with an alarm reaction or with resistance. The SAM and HPAC systems effects are depleted and the individual can no longer continue their resistance/adaptation to the stress. During this stage, the individual's resistance declines characterised by changes in immune suppression, cardiovascular integrity and musculo-skeletal effectiveness. These changes reduce the body's defences and minor illnesses typically arise from minor skin eruptions (e.g. herpes simplex), upper respiratory tract diseases (e.g. the common cold) gastrointestinal disturbances (e.g. indigestion, loss/ increase in appetite, diarrhoea/constipation) to cardiovascular pain which may lead to more serious or life threatening conditions (e.g. myocardial infarction).

3.13 Interaction-based

The interaction-based definition of stress is considered to be the combination of the stimulus and response-based models in which aspects of both the environment and the individual interact to produce stress. The interaction definition views stress as a mismatch between the individual's capacity and the environmental conditions.

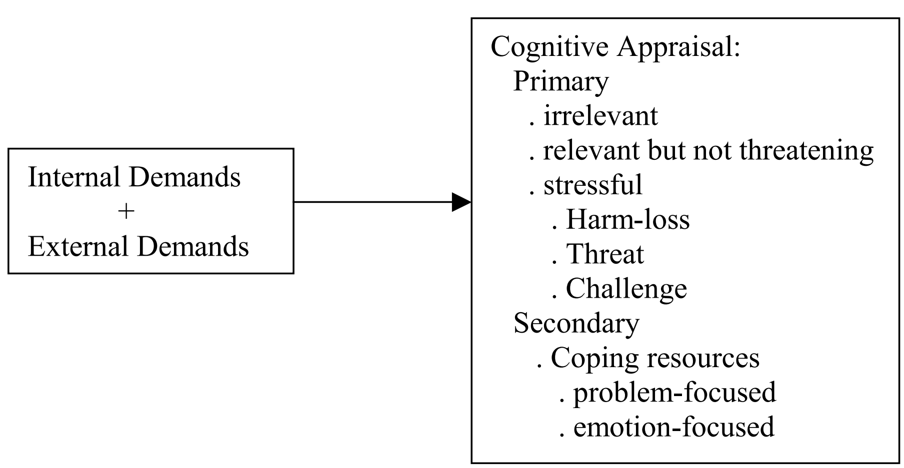
One of the most popular conceptualisations of stress is that proposed by Lazarus and his colleagues (Lazarus, 1966; Lazarus and Launier, 1978;

Lazarus and Folkman, 1984). However, according to Bartlett (1998), many people view the theory of stress of Lazarus and his colleagues as interactional but Lazarus has stated that their model is not interactional but transactional. This is because an interactional framework is viewed as structural and static and unidirectional. The transactional framework is process-oriented and takes into account the fluid dynamic relationships between the individual and the environment (Lazarus, 1990) that are constantly changing.

3.14 Transactional model

The conceptual framework for this present study is based on the transactional model of stress and coping proposed by Richard Lazarus and his colleagues (1978, 1984) (see Figure 3.1)

Figure 3.1 Transactional model of stress and coping



Adapted from Lazarus and colleagues transactional model of stress and coping (1978, 1984).

Their transactional model views stress and coping as productions of cognition, that is, as products of the way an individual appraises his or her relationship with the environment. Further, that it is these interactions between an individual and the environment that results in stress experiences and not simply whether or not a serious or significant event occurs. This model has been widely used because of its emphasis on the individual and his or her ability to cope with demands. It is not stress *per se* that is important in adaptation but it is the way we both perceive and cope with the event(s) and situation.

A transactional view of stress and coping has an important central feature. It emphases the process, on what is happening between the individual and the environment in any given stressful encounter and how changes, which occur over time or across encounters, are interpreted and reacted to. Thus, the process contains two elements which can be applied to the present focus of study. The first element focuses on the actual interchange between the individual and the environment e.g. with the birth of a premature infant, the focus is on the specific stressful encounter faced by the parents brought about by the premature rather than a term birth. The second element focuses on the flow and transformation of the interchange over time. It emphases flux and change over time in diverse encounters (Lazarus, 1981). That is, a stressful encounter is not a momentary static stimulus in the environment to which the individual gives a single response. Rather, it is a continuous flow of events over time e.g. the coping process of responding to the concerns and distress common to parents following giving birth to a premature infant. The process tends to occur over an extended time and encompasses many encounters that trigger a range of psychological and emotional changes. Initially, the parents may experience a range of negative feelings (shock, loss, guilt and sadness). Eventually, they may accept the loss of an expected full term infant and hopefully come to accept the premature birth.

Transaction has two meanings: (1) transaction means that not only does the environment affect the individual but the individual affects the environment, both influencing each other mutually in the course of an encounter; and (2) the transaction brought about by the interaction between the individual and the environment forms a series of new relationships. According to Lazarus and Launier (1978), the individual and the environment are seen to be in a dynamic relationship of reciprocal interaction, each affecting and in turn being affected by the other.

3.141 Cognitive appraisal

According to Morse (1989), the key factor in Lazarus theory of stress transaction is the cognitive system. Cognition refers to attitudes, attributes, beliefs, inferences and thoughts that operate at conscious, unconscious and preconscious levels (Dixon, 1981). The cognitive system produces interpretations of events that lead to making meaningful sense of myriad incoming sensations from both external social sources and the internal physiological environment (Morse, 1989). According to Lazarus (1966), the individual's cognitive system appraises incoming stimuli in two ways. Primary appraisal refers to the interpretation of stimuli into inferences of irrelevance, challenge or threat-harm. Secondary appraisal refers to the evaluation of one's coping resources that are presently or potentially available for dealing with the demand that has arisen. Accordingly, it is the quality of these appraisals that determine whether these transactions are stressful or not, and not only because of some intrinsic entity in the stimuli themselves. Lazarus's (1966) stress model refers to secondary appraisal as the second phase in the stress transaction, that involves one's subjective evaluations about the possible responses through applying of acquired skills and knowledge that can be brought to bear on the stress experience.

This secondary appraisal is concerned with judgements about readily available or potential coping strategies. These include personal resources (attitudes, beliefs, abilities, self-concept), styles (strategies, defences) and efforts (internal and external actions) (Menaghan, 1983). Coping then, is primarily a psychological construct concerning inner struggles with perceived demands, conflict and the emotional distress generated by these. It is a continuous process characterised by attempts to master and gain control over an external social world event; to maintain emotional and physiological equilibrium (internal reactions) in order to execute effective motivated actions and decision-making; to retain/regain flexibility of action; and to increase one's tolerance for negative realities in order to hold on to a positive self-image (Lazarus and Folkman, 1984).

3.142 Coping

Lazarus's definition of coping refers to the process of managing demands both external and internal that are appraised as taxing or exceeding the resources of an individual (Lazarus, 1993). This definition has three important characteristics. Firstly, it is process-oriented. Coping refers to what an individual actually thinks or does and the changes in these thoughts and actions as the situation unfolds. Secondly, the definition is contextual which emphasises that the transaction and process for any two events are not the same. Individuals use different coping strategies at varying phases of efforts to solve a given problem. Thus, coping is not determined solely by personal disposition but also by the individual's appraisal of the demands of a particular situation. Thirdly, coping is defined without reference to its outcome.

Coping refers to the efforts to manage moment by moment, not necessarily to the success of these efforts. People are often confronted with situations that cannot be mastered or controlled. In such cases, effective coping involves coming to terms with undesirable outcomes rather than mastering them. Originally, Lazarus (1966) referred to this type as ‘palliative coping’. Coping consists of efforts to manage, reduce, tolerate or minimise the demands created by the stressful transactions. So clearly, the relationship between coping and a stressful event represents a dynamic process and coping can be seen as a set of reciprocal transactions by which the event and the individual influence each other.

Lazarus and Folkman (1984) identified two forms of coping: (1) problem-focused coping which is the management of the problem that is causing the distress and (2) emotion-focused coping, the management of the emotions or distress that arise from the stressful transactions. Problem-focused coping is directed at defining the problem, generating alternative solutions and weighing up the options for action in terms of their costs and benefits. Problem-focused coping embraces an array of problem-oriented actions, which include strategies that are directed at the environment and those that are directed at the self which include cognitive problem identification and solving and decision making. Each of these may include interpersonal conflict resolution, information gathering, and advice seeking. Emotion-focused coping, previously referred to as palliative modes of coping, consists of the mobilisation of cognitive processes directed primarily at reducing emotional distress, and includes strategies that utilise a range of intrapsychic defensive processes (such as denial, repression and distancing, suppression or intellectualisation).

Emotion-focused coping is used to minimise anxiety, maintain hope and optimism, to reduce the reality of the fact and to acknowledge that the event is harmful (Lazarus and Folkman, 1984). Other strategies include reappraisal by changing the way an encounter is construed without changing the objective of the situation e.g. threat is diminished by changing the meaning of the situation, "I decided that there are more important things to worry about" (denial or suppression), "or looking at the brighter side of things" (rationalisation or intellectualisation). Problem- and emotion-focused forms of coping can be mutually facilitative. Coping has been named a "shifting" process in which a person must, at certain times, rely on one form of coping, say emotion-solving strategy and at other times, on a problem-solving strategy, as the demands of the situation change (Lazarus and Folkman, 1984).

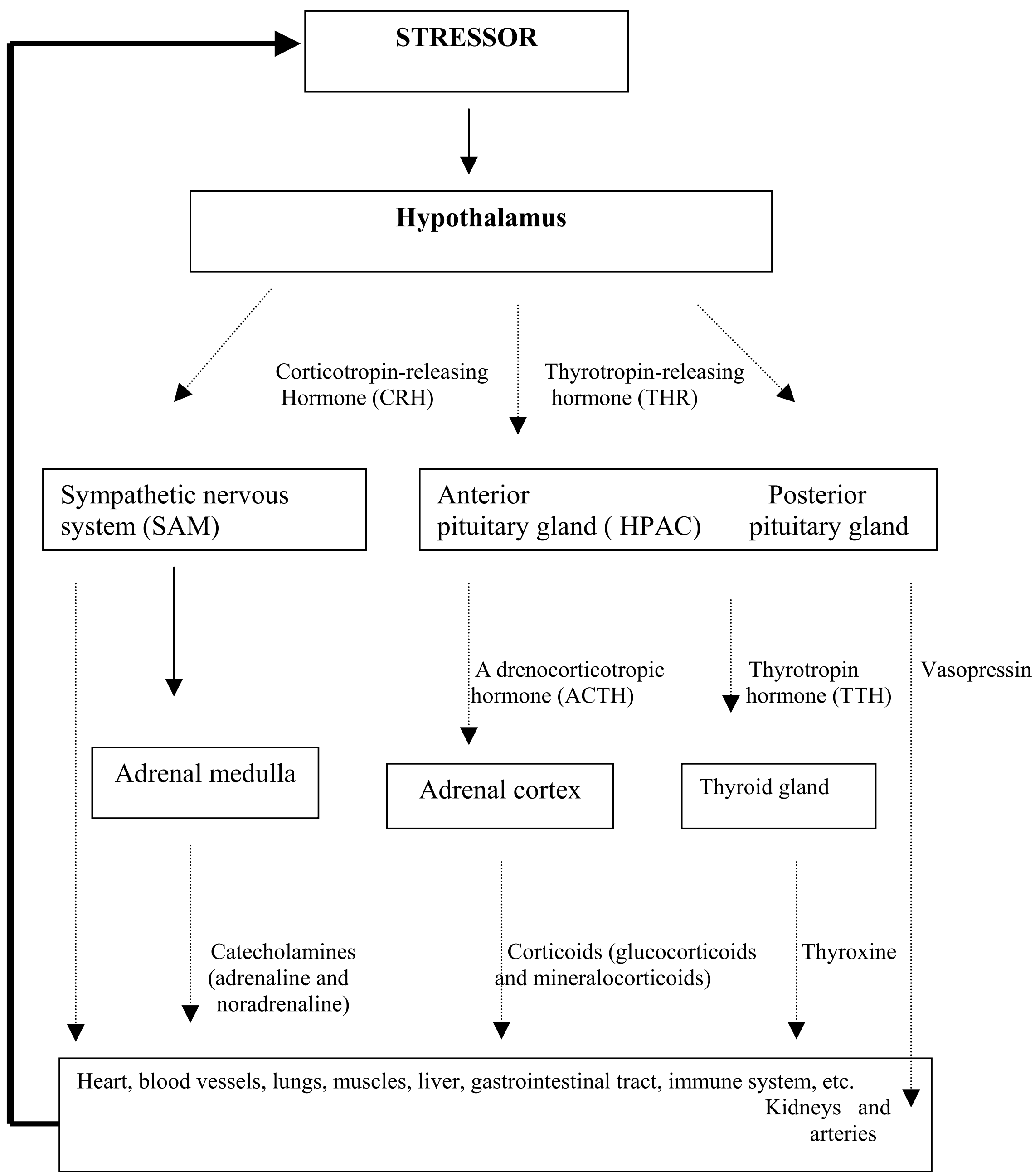
Although different coping strategies are used in different situations, Folkman and colleagues (1979) drew attention to the importance of considering the extent to which the situation is judged to be amenable to control. Conway and Terry (1992) proposed that a particular coping strategy is dependent upon the match of goodness of fit between the strategy and the appraised controllability of the event. According to the goodness of fit hypothesis, the effectiveness of different coping strategies will vary as a function of the extent to which the event is appraised to be controllable. Problem-focused strategies are proposed to be adaptive in situations perceived as controllable and maladaptive in situations perceived to be uncontrollable. In contrast, emotion-focused strategies are proposed to have positive effects on adaptation in uncontrollable situations and negative effects in situations perceived as controllable. Conway and Terry (1992) tested the hypothesis with university students and community residents and found that problem-focused coping strategies were used in controllable situations and emotion-focused coping strategies in uncontrollable situations. However, their findings did not support the hypothesis that the use of problem-focused coping strategies in uncontrollable situations have negative effects.

Lazarus (1984) rightly argues against a simplistic view on the conception of stress and further proposes that stress is viewed as a dynamic process between the person and the environment. However, limitations to Lazarus' theory of stress and coping have been proposed by some critics (Moos and Swindle, 1990). These refer to his failure to identify the environment and personal determinants of appraisal and coping. The environment can influence an individual's selection of coping strategies. For example, one copes differently with a stressor in a work setting and in a family setting. Different people have different roles in different environment which reflect their personal needs and commitments. Therefore, one needs to examine how the particular environment affects the individual's appraisal and coping responses. In this respect, the personal and individual factors that influence the individual's appraisal and coping need to be recognised. Also, it is important to take into consideration the cultural differences of parents, as individuals from different cultures respond to stress differently and employ different strategies for coping with stressful events (Kawanishi, 1995). Therefore, to increase our understanding of stress and coping, we need to know the meaning of the stressor to the individual, and their appraisal and coping styles.

3.2 **Physiological reactions to stress**

When triggered by stressful events, both the sympathetic-adreno-medullary and the hypothalamic-pituitary-adrenal cortical systems are activated (see Figure 3.2, p.86).

Figure 3.2 The stress response



Modified from Smith, J.C., 1985. Understanding stress and coping. p. 42

The body reacts to the impact of stress differently depending on the temporal relationship to the source of stressful event (stressor). During acute stress soon after the onset of the stress-provoking event the sympathetic-adrenal (SAM) nervous system is activated and when stress is prolonged/chronic the hypothalamic-pituitary-adrenocortical (HPAC) system is activated. There is no clear differentiation between an acute and a prolonged/chronic stressor, it depends on the duration of the impact the event has on the individual, the continuing threat on the individual, the vulnerability it arouses, and the continuing efforts by the individual to manage the event (Gottlieb, 1997).

3.21 Acute stress reactions

The 'fight or flight' syndrome described by Cannon (1939) is a response which prepares the body for action in an emergency situation. This description under scores Selye's theory of stress and refers to the activation of the SAM system when a stressful situation is encountered. This response involves the activation of the SAM via the neural pathways (see Figure 3.3, p. 88)

Figure 3.3 Sympatho-adrenomedullary system

Hypothalamus

↓

Sympathetic Nervous System

↓

Adrenal Medulla

↓

Noradrenaline/Adrenaline

↓

Physiological activation

↓

↑ arterial blood pressure, heart rate, cardiac output
↑ breathing rate
↑ stimulation of skeletal muscles
↑ free fatty acids and glucose
↑ release of endogenous opoids
↑ blood flow to kidneys, gastrointestinal system and skin

Modified from Everly, G.S., 1989, p. 34

When individuals are exposed to acute stressors (e.g. undergoing a surgical procedure, just before an examination or a race), the sympathetic division of the autonomic nervous system becomes activated and prepares the body for action by producing bodily changes which facilitate the expenditure of energy. The sympathetic branch of the autonomic nervous system innervates the inner part of the adrenal gland known as the adrenal medulla, causing the release of two chemicals; adrenaline (previously called epinephrine) and noradrenaline (or nor-epinephrine), known collectively as the catecholamines.

These two neurotransmitters intervene across the synapse in a rapid transmission and therefore act very quickly in mobilising the body's resources by increasing the conversion of glycogen to glucose, increasing cardiovascular activity and other bodily changes which help prepare the body to either ‘fight’ (resist) or flee from the threatening situation. These bodily responses include: increasing cardiac output by increasing heart rate, stroke volume and force of contraction, thereby ensuring that there is adequate blood flow to supply oxygen to the active body; shunting the flow of blood away from the skin and the intestines and towards the muscles, which ensures that the blood transports oxygen to where it is needed; and increase the rate of breathing and the amount of air intake into the lungs by breathing more deeply; all of which serve to oxygenate the blood (Everly, 1989).

3.22 Chronic stress reactions

Another pathway through which stress can exert its effects involve the endocrine system. The endocrine system consists of a number of glands located throughout the body which secrete hormones directly into the bloodstream. However, the endocrine system is much slower than the nervous system in responding to stress because the activating chemicals (hormones) are carried by the bloodstream to the receptors sites and for this reason it is more closely associated with chronic (prolonged) stress response (Bartlett, 1998). The hormonal pathway which is activated during chronic stress is the hypothalamic-pituitary-adrenocortical system (see Figure 3.4, p. 90).

Figure 3.4 Hypothalamic-pituitary-adrenal cortical system

↓

Anterior Hypothalamus

↓

CRF released

↓

Anterior Pituitary activated

↓

ACTH released

↓

Adrenal Cortex activated

↓

Corticoids released

↓

Physiological Activation

↑ arterial blood pressure, heart rate, cardiac output
↑ free fatty acids and glucose (energy resources)
↑ excretion by salivary glands, sweat glands, gastrointestinal tract
↓ inflammation } ↓ lower the efficiency of the
↓ lymphocytes } immune system

Modified from Everly, G.S., 1989, p. 35

When the HPAC system is activated, the neurons in the medial basal hypothalamus secrete corticotropin releasing factor. The CRF is transported to the anterior pituitary via the hypothalamic-hypophysial portal system which consists of a network of small blood vessels. The CRF descends to the anterior pituitary which responds by releasing adrenocorticotropic hormone into the systemic circulation (Guyton, 1991). ACTH stimulates the cells of the zona reticularis and zona fasciculata of the adrenal cortex to release the secretion of corticoids, mainly glucorticoids, such as cortisol and corticosterone, into the systemic circulation to assist an individual to combat the stressful event. The direct effects of glucocorticoids are to increase the release of blood glucose and prepare the body for action and this metabolic demand is increased by the conversion of amino acids to glycogen in the livers (Everly, 1989). Glucocorticoids also mobilise free fatty acids from the adipose tissue and break down protein. Glucocorticoids have a profound influence on the immune system by suppressing immunologic and inflammatory responses. In addition, glucocorticoids have an effect on the cardiovascular system and maintain the arterial blood pressure.

3.23 Amygdaloid complex

In recent years, attention has been devoted to the role of the amygdala in response to emotional stress, but the focus has been on one component of the amygdaloid complex, the central nucleus of the amygdala (CeA). The interest in the role of CeA in the human stress response was initially demonstrated in studies of the haemodynamic responses to noise (Galeno et al., 1984). Since then, studies have reported that CeA lesions disrupted ACTH and corticosterone responses to emotional stressors (Van de Kar et al., 1991; Roozendaal et al., 1992; Prewitt and Herman, 1994).

There is now evidence to suggest that the medial amygdala (MeA) has a role in the generation of endocrine responses to stress. Silverman and colleagues (1981) and Sawchenko and Swanson (1983) found greater numbers of MeA than CeA cells project to the paraventricular nucleus, the location of the CRF cells that constitute the apex of the HPA axis. This finding indicated that it is the medial rather than the central amygdala that is critical to hypothalamic neuro-endocrine cell responses during an emotional response. Feldman and colleagues (1994) tested the role of MeA in HPA axis responses to emotional stressors and found that electrolytic MeA lesions were as effective as CeA lesions in blocking ACTH and corticosterone responses to stressful stimuli. Dayas and colleagues (1999) carried out a study on adult rats to evaluate the role of the central amygdala in generating neuroendocrine responses to an emotional stressor. Brief restraint (15 min) was used as a stressor on the adult rats and they found that the medial elicited c-fos expression more strongly rather than the central nucleus of the amygdala. Subsequent experiments showed that medial lesions reduced the activation of supraoptic and paraventricular nucleus oxytocinergic neurosecretory cells which commonly accompanies stress-induced HPA axis activation in rodents. These findings indicated that it is the medial rather than the central amygdala that is critical to the hypothalamic neuroendocrine cell responses during an emotional response.

3.3 **Relationship between coping and emotions**

Emotion has been defined as a complex organised psychophysiological reactions consisting of cognitive appraisals and patterned somatic reactions (Lazarus et al., 1970; Lazarus et al., 1980). Coping and emotions are usually identified as undirectional and fixed. The traditional model of coping and emotion emphasised emotion as the antecedent of coping, that is coping is viewed as a response to emotion. For example, parents' responses to a premature birth will predetermine how the parents cope with the situation. However, coping is not merely a response to emotion but it is also strongly influenced by how the person appraised the significance of the situation to their well-being, which is then incorporated in the emotion, that is, whether it is anxiety, anger, or fear (Folkman and Lazarus, 1988). To understand the relationship between emotion and coping it is important to view them as a process (Folkman and Lazarus, 1988). Coping and emotion occur in a dynamic mutually reciprocal relationship. The person appraised the situation which in turn changes the person-environment relationship, and hence, the emotional response. The situation can be appraised as either irrelevant/benign, harmful, threatening or challenging. For example if the parents giving birth to a premature infant appraised the preterm birth as of no concern, the parents would not experience strong negative emotions (e.g. anxiety or anger), but if the parents appraised the situation as harmful/threatening then they would be anxious and angry.

Coping can affect emotion in several ways for example by diverting attention from the source of stress by using avoidance thinking strategies (e.g. denial, intellectualising) or by directing attention towards the problem in an effort to prevent or control it (problem-solving). Coping by avoidance is one of the most common ways people deal with stress. In contrast, by finding solutions to the problems stress can be reduced by having a sense of at least some control of the situation.

3.31 Individual differences and emotions

There is now support that individual differences may contribute to how the emotion was experienced. In particular, the impact of both negative and positive personality characteristics on emotion. Individuals who have more negative personality characteristics (e.g. depressive or Type A disposition) reported higher levels of emotional distress and negative emotions when faced with either stressful or non-stressful events (Winter and Kuiper, 1997). A review of the literature has indicated that individual differences in personality mediate affective responses to life events. Kuiper and colleagues (1990) and Segal and Sallow (1993) have shown that a person who is depressed is more likely to report a variety of other negative emotional affects (e.g. anxiety, guilt and sadness). Olinger and colleagues (1987) showed that a person who is susceptible to depression displayed higher levels of self-reported stress than an individual who is less vulnerable to depression. Kuiper and Martin (1989) found that individuals with Type A characteristics tend to be more prone to increased depressive affect and reported more anger than those who did not display Type A characteristics. While negative personality characteristics tend to display negative effects, positive personality characteristics (e.g. optimism, less anxious) have been shown to display positive affects. For example, Carver and Gaines (1987) explored the effects of positive personality characteristics (trait optimism) in a group of women during their transition from pregnancy to parenthood and found, at three weeks postnatally, that their level of optimism was inversely related to depressed mood. Scheier and colleagues (1989) found that patients with high trait optimism reported lower levels of hostility and depressive affect prior to surgery and at postsurgery reported greater happiness, relief and satisfaction than others scoring low on this characteristic.

3.4 **Gender differences in coping**

It has been reported that women exhibit higher levels of emotional distress than men (Thoits, 1991). Three explanations have been offered. First, it has been suggested that women are socialised to be more expressive and therefore will show more emotional symptoms than men in response to standardised psychological distress measures (Newman, 1984). Second, it has been suggested that women face more stressors than men (Kessler and McLeod, 1984; Aneshensel and Pearlin, 1987). Third, it has been suggested that women lack coping resources and appropriate coping strategies for handling the stressors to which they are exposed (Kessler and Essex, 1982; Turner and Noh, 1983).

According to Thoits (2000), our culture portrays women as emotional, helpless and dependent and men as rational, independent and problem-solvers. Veroff and colleagues (1981) surveyed a large sample of adults on how they handled worries and periods of unhappiness. They found a significant number of men reported doing nothing or not thinking about it but also engaging in more problem-solving strategies. On the other hand, women reported seeking social support or prayer as ways of coping.

Stone and Neale (1984) surveyed men and women on coping with their daily problems and found that men often reported taking direct actions, whereas women engaged in more passive strategies including distraction, catharsis and prayer. It was also found that women were more likely to seek social support from important others.

Studies have shown that gender differences in coping tend to emerge within specific problem situations. Folkman and Lazarus (1980) and Pearlin and Schooler (1978) found that in work situations, men were more likely to use problem-solving strategies than women, whereas, in marital and parenting situations women tend to use more problem-solving strategies (Menaghan, 1982; Pearlin and Schooler, 1978). Women were also found to seek advice or social support when facing marital and parenting problems (Fleishman, 1984). Thoits (2000) suggested that problem-solving strategies are more likely to be used when individuals perceive that they have more control, power, or responsibility in a particular role domain (e.g. men in work–situations and women in family-situations). Conversely, in situations where individuals perceive uncontrollability, they are more likely to use emotion-focused strategies to alter the meaning of the situation or to attempt changes to their emotional states. Folkman (1984) has also argued this pattern of coping explicitly. In situations where individuals appraise a stressor as controllable, problem-solving strategies were used while in situations where individuals appraised a stressor as uncontrollable, emotion-solving strategies were used. To examine this pattern of coping, Thoits (2000) studied 200 undergraduates at Indiana University to find out how they handled negative situations. She found that male and female students differed greatly in their coping strategies. Female students were more likely to express their feelings freely, would try to see the situation differently and sought social support. Male students were more likely to think through the situation and accept the situation. Overall, the findings also showed that stereotypes in patterns of coping were weakly supported. Also, there was no association between the perceived control of the event and the use of problem-solving strategies. Stone and Neale (1984) also found no relationship between perceived controllability of a stressor and the likelihood of taking direct action to cope with it.

Studies of parents of premature infants have also found that mothers and fathers cope differently when faced with the challenges and threat of premature birth. Affleck and colleagues (1991) questioned parents just before their infant's discharge about the types of coping strategies they had used during their infant's stay in hospital. Most mothers used the strategy of seeking social support from their spouses and other family members, friends, and parents of other premature infants in NICU, as well as looking for meaning in the NICU experience. A high proportion of the fathers likewise sought meaning from the experience, but also made attempts to minimise the impact of the experience by seeking social support. Hughes and colleagues (1994) interviewed 32 mothers and 25 fathers of premature infants within three weeks of their infant's birth about their coping strategies and found that these parents also coped mostly by seeking social support from their spouses, others (not specified) and the medical staff. However, there were differences in the source and type of support sought by the mothers and by the fathers. Mothers sought emotional support predominantly from their spouses. In contrast, the fathers were more likely to interact with the medical staff to obtain information about their infants' conditions. As most medical staff are frequently male, this support seeking by fathers could be construed also as seeking comfort through male solidarity. Lohr and colleagues (2000) examined the perception and coping strategy of parents of premature infants at two to three weeks and six to seven weeks after the premature birth. They found differences between the mothers and fathers. Fathers expressed less negative emotions, while mothers were shocked and grieving. The most important coping strategy for mothers was seeking social support from their spouse.

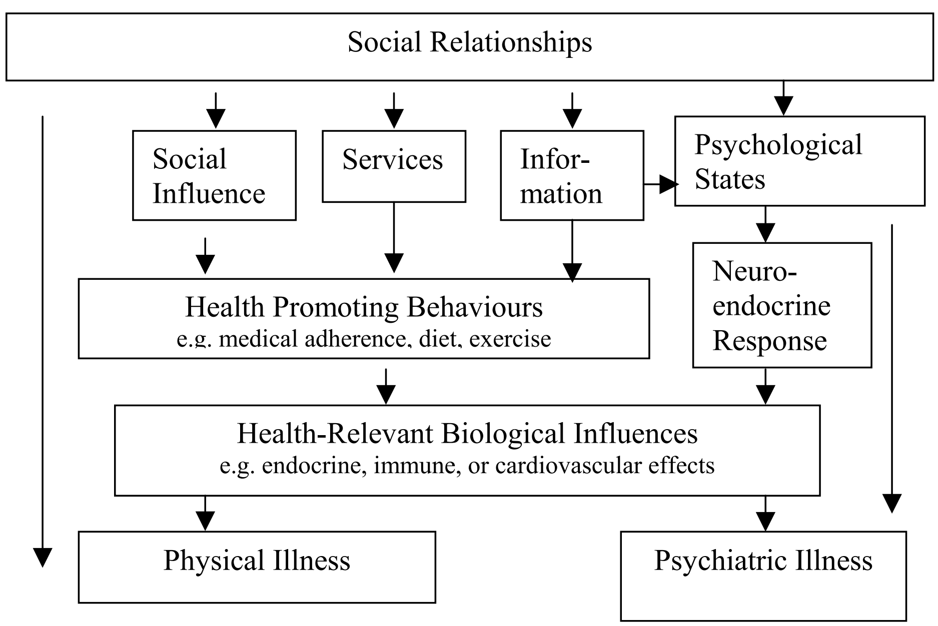
3.5 **Social support**

The concept of social support has been strongly linked to the notion of stress (Cutrona and Russell, 1990) and coping efforts have been shown to be facilitated by social support (McHaffie, 1992). Adequate social support positively assists an individual in coping with stressful events (McHaffie, 1992). Social support can be classified into four types (Cronenwett, 1985; Cutrona and Russell, 1990): (1) *instrumental* support is also known as material support involving the provision of goods or services such as home help and financial contributions; (2*) emotional* support consists of love, encouragement, expressions of caring, and trust. Another form of emotional support is through religion (e.g. prayer or visiting a priest). Emotional support has been demonstrated to contribute to the well being of an individual (Wills, 1981) and is proposed to operate through the enhancement of self-esteem. Burr and colleagues (1979) observed that support in the form of positive feed back from significant others (i.e. family members) in role performance enhances the quality of role enactment and self-concept; (3) *informational* support involves providing information useful in coping with personal and environmental problems; and (4) *comparison* support consists of advice, information or encouragement given by someone in the same or similar situation.

People with similar experiences or in the same or similar situations are perceived to have the most useful information to share and to have credibility with their advice. For example, in this present study, parents who have a premature infant in SCN could be helpful to turn to for information, although typically the information is mostly highly sensitive.

The two explanatory models of how social support mediates stress and enhances health are (1) by direct effects and (2) by a buffering effect. The direct effects model proposes that coping will occur as a result of the perception that others will provide help in the event of stressful occurrences or as a result of integrated membership in a social network (Cohen and Syme, 1985) (see Figure 3.5,).

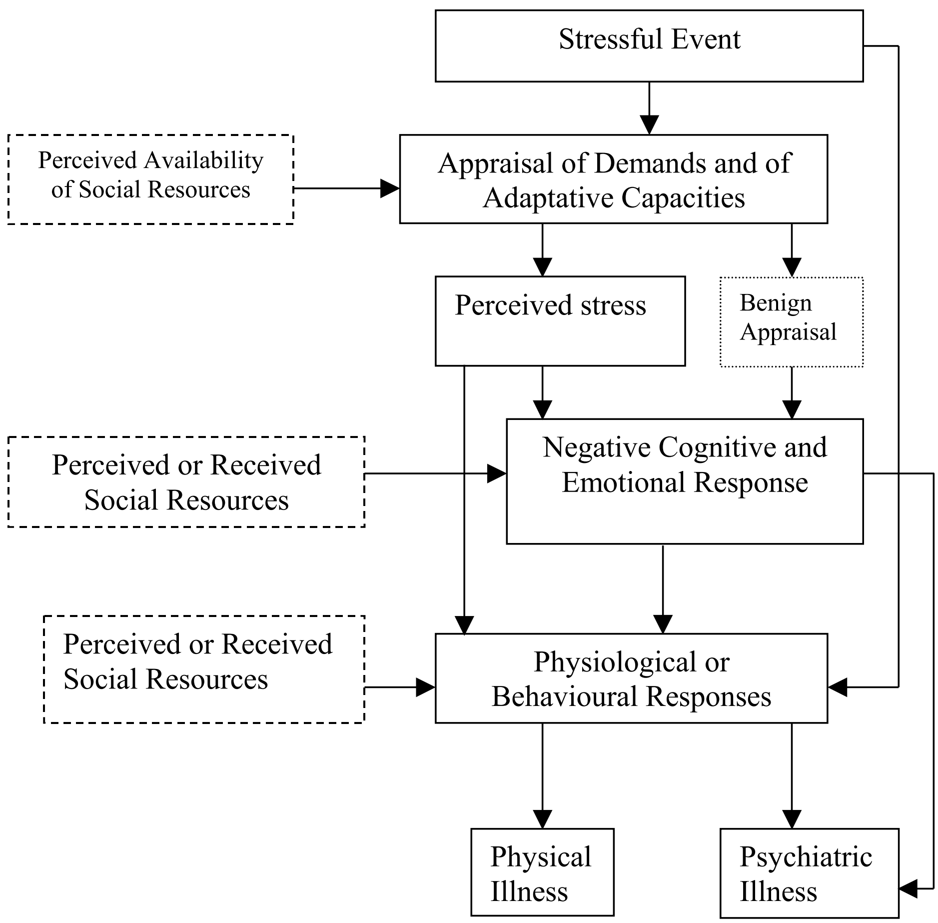
Figure 3.5 Direct effects model



Adapted from Cohen et al., 2000, p.12.

In contrast, the buffering model focuses on the functional relationship between the coping requirements of a situation and the resources provided by one's support system (Cohen and McKay, 1984) (see Figure 3.6).

Figure 3.6 Stress-buffering model



Adapted from Cohen et al., 2000, p.13.

In the buffering model support plays a role at two different points in the stressful event. Firstly, support may intervene between the stressful event and a stress experience by attenuating or preventing a stressful response. Secondly, support may intervene between the experience of stress and the onset of pathological outcomes by reducing or eliminating the stress experience or by directly influencing the arousal of physiological processes. That is, support may mitigate the impact of stress.

Cohen and Syme's (1985) model of direct effects postulates that the availability of supportive ties e.g. the number of ties in a social network or the frequency of contact with members of the network seem to mediate stress and promote good health. It is commonly believed that ties are not always supportive because it is unlikely the same network is able to render support in response to different types of life events. Cohen and McKay's (1984) model that social support buffers the impact of stress can be argued on the basis that the model will be effective only when the type of support provided matches the coping mechanism elicited by the stressor. Therefore, the type of support is most effective when it is viewed by the recipient as suitable to the demand, as inappropriate support could accentuate rather than moderate the stress effects.

One conceptualisation of social support is perceived social support, defined as the general perception that others are available and desire to provide assistance should the individual need it (Pierce et al., 1990). The term perceived social support has been used to refer to the extent to which an individual believes others value, care for, and desire to help him/her (Sarason et al., 1983). Perceived social support has been shown to correlate negatively with measures of neuroticism and trait-anxiety, and to correlate positively with measures of extraversion (Sarason et al., 1983). Sarason and colleagues (1991) found that subjects with high perceived support ascribe to themselves more positive and less negative attributes than subjects low in perceived social support. This finding suggests that perceived social support may enable individuals to develop more effective and realistic coping strategies for dealing with particular situations. Individuals with perceived high social support may confront challenges more effectively because they believe others will help or 'rescue' them if the challenges exceed their personal resources (Pierce et al., 1996). There is evidence suggesting that people's appraisal of the support that might be available to them may be even more important than their actual interpersonal contacts (Antonucci and Israel, 1986).

Cohen and Wills (1985) reviewed more than 40 studies which have been designed to test the hypothesis that social support protected people from the negative emotional effects of life stress. They concluded that there was consistent evidence that perceived social support has a stress-buffering effect. The essential component of all studies reviewed has been that it is the perception that others will provide resources when they are needed that is the key to the stress-buffering effect. Therefore, the studies demonstrated that whether or not one actually receives social support is less important than one's beliefs about its availability.

According to Pierce and colleagues (1990) and Sheppard (1993), it is recognised that social support is a multidimensional concept and requires analysis of the interactive roles of the (i) situational, (ii) intrapersonal, and (iii) interpersonal contexts of social transactions.

(i)The situational context includes the social setting in which support either occurs or is absent and the characteristics of the stressor itself are likely to form an important part of the context influencing the process and outcome of support mobilisation. Stressors that are visible to one's social network (e.g. birth of a premature infant) are more likely to result in support mobilisation from one's social network.

(ii) The intrapersonal context refers to the individual's perception of self, important others and the quality of relationships between one self and important others. This sense of connectedness is related to the individual's experience of self-esteem, feelings of self-worth, and the perception of being loved, cared for and valued by others (Sarason et al., 1990). Personal characteristics including attitudes, beliefs, habits may significantly affect whether the individual will seek social support or not.

An individual's personality characteristics may lead to behaviours that encourage or discourage supportive behaviours from others. How an individual views and interacts with his or her social environment has an impact on whether support will be provided or not.

An individual with well developed social or interpersonal skills tends to attract more social support because they are comfortable when interacting with others and have the ability to make friends (Sarason et al., 1996). Eckenrode (1983) showed that personal characteristics such as level of education, locus of control, and beliefs about the efficacy of help seeking are related to support mobilisation. Riley and Eckenrode (1986) studied women who used a health clinic and found that women who have a high level of socioeconomic resources (e.g. high educational level and occupation) were able to mobilise social support and reported a lower level of negative effects. A variety of personality characteristics has been shown to correlate with perceived social support, including extraversion, neuroticism, self-esteem and assertiveness (Procidano and Heller, 1983; Sarason et al., 1983). As reported previously, it has been shown that social support correlates positively with extraversion and negatively with neuroticism (Sarason et al., 1986). There is also evidence that depression and hostility are inversely related to social support (Sarason et al., 1986). Logsdon and colleagues (1994) found that mothers receiving social support had a lower incidence of postnatal depression.

(iii) The focus on a person's social network (e.g. friends, relatives, extended family) and emphasis on interpersonal context refers to network size and density. Network size reflects the number of different people in a person's social network. As network size increases social support may increase too. Network density refers to the extent to which members of a network are connected to each other. Increased density within a network should contribute to feelings of solidarity and cohesiveness among network members (Albo and Moore, 1978), it facilitates the flow of information and would thus increase the speed or likelihood of a stressor being known to potential supporters (Hall and Wellman, 1985). Gennaro and colleagues (1993) studied 95 mothers of preterm infants but did not find social support to mediate stress, anxiety, or depression nor to be related to health outcomes. In addition, Affleck and colleagues (1989b) concluded that well-meaning friends and relatives could actually make coping with a sick preterm infant worse, with misguided and unwanted attempts to support and insensitive remarks.

3.6 **Stressful life events as stressors**

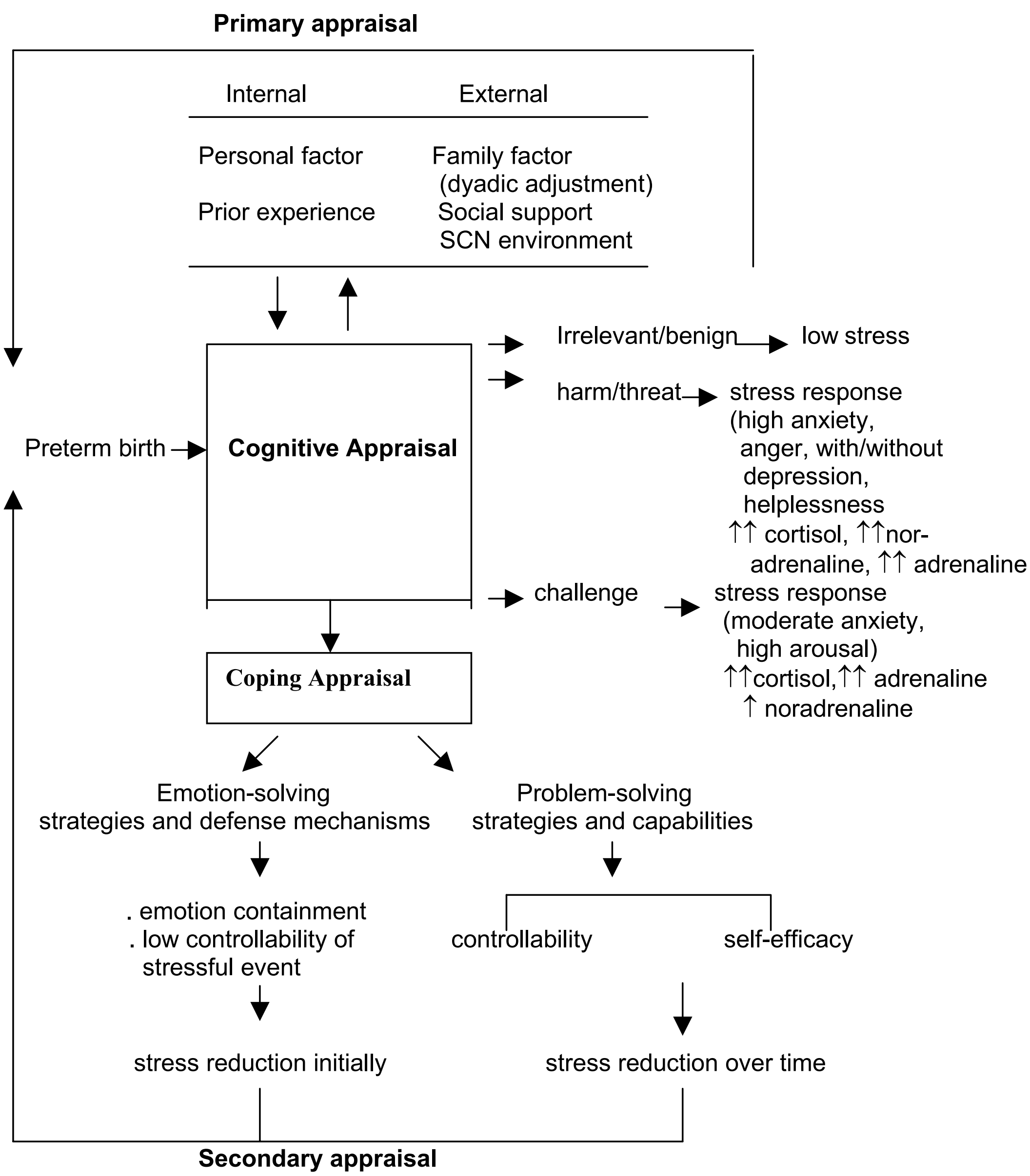
In the 1960s considerable attention was paid to the impact of 'life events' on the individual. The best known and most widely used instrument to measure life events was the Holmes and Rahe's Social Readjustment Rating Scale (SRRS:1967). The conceptualisation of this checklist was based on the idea of the amount of change generated by the particular stressful event. However, it was soon realised that it is not change *per se* that matters but the contextual characteristics such as the contextual threat (Brown, 1989) and the available level of personal control over the event occurring (Dohrenwend et al., 1993) must also be considered. In view of this new idea, the contextual characteristic is measured by means of detailed analyses based on interview probes, rather than sole use of a checklist instrument. This view led to the development of the Structured Event Probe and Narrative Rating (SEPRATE: Dohrenwend et al., 1993). The most widely used interview method is the Life Events and Difficulties Schedule (LEDS: Brown and Harris, 1978). The LEDS is a semi-structured survey instrument. The interview consists of a series of questions asking whether certain events had occurred over the past 12 months or longer with general guidelines for probing positive responses. In view of the unstructured probing, several versions of the LEDS have been developed, that include structured probing which would both shorten the time it takes to administer the interview and determine the event ratings. The three new versions of the LEDS are (1) The Structured Life Events Inventory (SLI: Wethington et al., 1993); Costello's Two-Stage Screening Method (Costello, 1982; Costello and Devins, 1988) and the Edinburgh Version of the LEDS (Miller et al., 1986). Other interview measures were The Detroit Couples Study Life Events Method (Kessler and Wethington, 1991); The Munich Events List (Wittchen et al., 1989); The Paykel Brief Life Event List

(Paykel, 1983); and The Henderson, Byrne, and Duncan-Jones List of Recent Experiences (Henderson et al., 1981). With this list of measures, selecting the appropriate method should be based on its suitability to answer the research questions and its practicality. LEDS measure is today regarded as the most robust because it has a higher interrater reliability and validity then those of checklist instruments and this appears to be related to the style of questioning as well as the rating procedures (Brown and Harris, 1989). Compared with checklists, LEDS ends up with data that are richer in terms of depth of understanding of the impact of the stressor. The LEDS has also less fallout in reporting severe event over time then other instrument such as Structured Life Events Inventory because of the interviewing technique.

Boss (1987) reviewing family stress found that although many stresses were unpleasant (e.g. separation or death in the family), pleasant events (e.g. moving to a better accommodation or birth of a child) may also demand considerable adaptation. The level of stress provoked by the event depends on the individual appraisal of that event, whether it is irrelevant or threatening. Life event studies have confirmed that people who have high satisfaction with their relationships were healthier, both physically and mentally than those who did not (Edwards et al., 1998; Whisman, 1999; Prigerson et al., 1999). There is also an extensive body of research on ‘life events’ indicated that people with large social network experienced a greater sense of well-being than those who did not (Frude, 1991). Wills (1984) suggested that social support strengthens the individual's feeling of being in control and assures them that they are valued. As a result self-esteem is increased, and this increases physiological tolerance and resistance to stress.

3.7 A model of understanding stress and coping of parents with premature infants admitted to a SCN.

Figure 3.7 **A model of understanding parental stress and coping in a SCN**



This model provides a conceptual framework for understanding parents' stress experiences and their subsequent attempts at coping with the birth of a preterm infant that is admitted to a SCN. The key concept in this model is each parent's cognitive assessment of the situation, a process which involves appraising the importance and severity of the demands matched against an evaluation of one's abilities to respond. The cognitive processes of the parent are influenced by internal factors such as personal characteristics (personality traits, cognitive style) and prior experiences of the same or similar events. Previous exposure and successful coping would provide a sense of control and mastery, leading readily to resulting in adaptation to the stressor and reduced stress levels. External factors, such as cultural background, satisfying dyadic relationships could influence the parent's appraisal of the event through the availability of perceived social support from extended family network. Stimuli from the SCN environment (e.g. the physical sights and sounds of the nursery, infant's appearance and behaviours) and the quality of staff communication and relationships (psychosocial sources) also contribute to the stress experience. If the parent appraises the preterm birth as of limited impact (irrelevant\benign) the stress would be minimal. If the event is appraised as harmful/ threatening then stress responses are likely to result in high emotions of anxiety and anger, often which, if unrelenting could lead to depression and helplessness. If the event is appraised as a challenge that can be managed then moderate anxiety and high arousal are to occur.

However, if the parent's coping responses are effective through the use of emotion-managing strategies (e.g. defence mechanisms of avoidance, denial, or suppression) initially stress will be reduced. If problem-solving strategies, are available, such as seeking clear information of the event, engaging in choice decision-making can aid in increasing a sense of control of the event and this also enhances self-efficacy with the result that stress will be manageable over time.

3.8 **Personal control and health**

Steptoe (1989) suggested that there are three broad perspectives when considering the relation of personal control to health and illness: (1) an individual's behaviours over an environmental stressor; (2) the notion of perceived control; and (3) individual differences in behaviours, beliefs and preferences for control. It has been well documented that the experience of a sense of control over one's situation impacts significantly on the general physical and emotional health of the organism. Studies have shown that when stressors are uncontrollable, fear, anxiety, and depression may be experienced (Foa et al., 1989; Mineka and Kelly, 1989). Lack of control may also affect health through triggering changes in behaviours. For example, an individual experiencing a stressful situation may resolve to use responses to cope that are health risks in themselves, such as smoking excessively and heavy drinking (Steptoe, 1989).

The concept of perceiving that control over events is possible has similar effects to actually having control over the event, even though no action has been taken (e.g. Arntz and Schmidt, 1989). A second element of ‘perceived control’ refers to strategies to regulate the impact of stressful events by attenuating emotional responses through the use of emotion-focused coping (e.g. anxiety reduction).

The first aspect of individual differences operating within a health context is the notion that people know that they ought to improve their health, but in fact they fail to take any action because they doubt that they have the ability to do so. The second dimension is the individual’s need, preference or desire for control and in Steptoe’s model, the third dimension is the individual’s difference construct termed ‘Locus of Control’. The concept of internal versus external locus of control was developed out of the social learning theory (Rotter, 1966). If the person perceives that the event is contingent upon his own behaviour, it is termed as internal control and if the event is contingent upon luck, chance, fate it is termed as external control (Rotter, 1966). From this theory, Rotter developed the I-E Scale, the more generalised, non-health-specific measure. Based on the Rotter’s I-E Scale, Wallston and

Wallston (1978) developed the multidimensional Health Locus of Control (MHLC) which tap the beliefs that the source of reinforcements for health-related behaviours is primarily internal, external or under the control of Powerful Others. This construct would influence how the individual responds to a stressful event.

3.9 **Summary**

Stress is a popular concept but there are various definitions of the construct. There are three approaches in which the term stress has been used. The first approach refers to stress as a stimulus, the second approach considers stress as a response and the third approach views stress as a complex set of dynamic interactions between an individual and the environment.

Coping should be viewed as both a marker of emotions, and also as an influence on emotion. The person appraises the situation which in turn changes the person-environment relationship, and hence, a range of emotional responses are possible. Individual differences play an important role in emotion. Individuals with negative personality characteristics report higher levels of emotional distress than those with positive personality characteristics.

It is important to consider the effectiveness of coping strategies between the strategy used and the appraised controllability of the situation.

According to the goodness of fit hypothesis, the effectiveness of different coping strategies will vary as a function of the exent to which the event is appraised to be controllable.

The concept of social support has been proposed as a mediating variable to the notion of stress, and adequate social support has been widely perceived to provide an individual with the ability to cope with a stressful event. One conceptualisation of social support is perceived social support which is the general perception that others are available to provide assistance should one needing it.

Studies of life events have shown that both positive and negative events have an impact on the health and well-being of the family and that the event that demanded the most adjustment, the greater was the likelihood that the individual would suffer from some physical and psychological stress. The level of stress provoked by the event depends on the family appraisal of that event, whether it has an impact on the stability of the family unit. The social support plays an important role in reducing the stress of the family.

An individual reacts to stress by activating a complex repertoire of physiological, biochemical and psychological responses. Exposure of an individual to a variety of stressors activates the sympathetic-adreno-medullary system during acute stress and the hypothalamic-puituitaryadrenocorticol system during prolonged or chronic stress. In response to a stressor, the sympathetic autonomic system releases catecholamines and the hypothalamus releases corticotropin hormone that stimulates the adrenal cortex to release the glucocorticoids such cortisol and corticosterone into the systemic circulation.

Given that stress can produce various responses, researchers have used a wide variety of indicators of stress, these include self-reports of perceived stress; physiological measures of heart rate, blood pressure and skin conductance and finally biochemical markers of stress. For a comprehensive assessment, both subjective and objective indicators should be included in a research study and this will be presented in the next chapter.

Chapter 4 Stress measurements **Page**

Chapter 4

Stress measurements

4.1 **Subjective measures**

4.11 State-Trait Personality Inventory

State anxiety refers to an unpleasant emotional state which consists of feelings such as nervousness, tension, apprehension, and worry, together with arousal of the autonomic nervous system (Spielberger, 1972). Depending on the stressfulness of the situation these emotional states fluctuate over time and in intensity. Trait anxiety refers to relatively stable inherent differences of individuals in terms of their proneness to anxiety when facing stressful situations (Spielberger et al., 1995). Individuals high in trait anxiety tend to perceive a wider range of situations as threatening compared to individuals low in trait anxiety. Therefore, it can be assumed that individuals high in trait anxiety are more likely to experience more frequent state-anxiety when they encounter threatening situations (e.g. birth of a preterm infant).

Spielberger and colleagues (1970) developed an instrument known as the state-trait anxiety inventory to provide reliable, relatively brief, self-report scales for assessing both state and trait anxiety. The correlations of scores on the trait-anxiety scale with the Anxiety Scale Questionnaire (Cattell and Scheier, 1963) and Manifest Anxiety Scale (Cattell and

Scheier, 1963) range from 0.73 to 0.85 indicating a high degree of concurrent validity (Spielberger et al., 1995). The alpha coefficients of trait-anxiety, normed on a sample of navy recruits aged 18-33 years for both male and female (198 male, 72 female) were 0.80 and 0.84 respectively and state-anxiety 0.89 and 0.92 respectively. On a group of college students (ages not specified) (95 male, 185 female) the alpha coefficients for trait-anxiety were 0.82 and 0.85 respectively and state-anxiety 0.84 and 0.88 respectively (Spielberger et al., 1970). These psychometric indices demonstrate high level of internal consistency and validity of the state-trait anxiety personality inventory in different populations and between male and female.

Anger as an emotional state refers to feelings that varies in intensity from mild annoyance to intense fury (Spielberger et al., 1983). Spielberger and colleagues (1970) developed the state-trait personality inventory of which anger measurement was one of the three subscales, the other two being anxiety and curiosity. The state-trait anger scale assesses the intensity of anger as an emotional state, and the individual's anger as a personality trait. State-anger was defined as a psycho-biological state consisting of subjective feelings of anger that vary in intensity with arousal of the autonomic nervous system (Spielberger et al., 1995). The trait-anger construct was defined in terms of individual frequency with which anger was experienced over time (Spielberger et al., 1995). The alpha coefficients of trait-anger for the navy recruits aged 18-33 years for both male and female (198 male, 72 female) were 0.85 and 0.82 respectively and state-anger were 0.92 and 0.90 respectively (Spielberger et al., 1970), again indicating high internal consistency of the measured construct.

Deffenbacher (1992) used the trait-anger scale to assess the correlation of scores and the frequency of emotional states of anger in two groups of students, one group of students from the abnormal psychology course and the second group of students from the introductory psychology course. He found that individuals with high-anger scores reported experiencing a greater frequency of daily feelings of anger across a wide range of situations they perceived as provocative.

In responding to the state-anxiety and anger items, subjects report how they feel “right now” by rating the intensity of their anxiety or anger feelings on a four-point scale: where 1 = not at all; 2 = somewhat; 3 = moderately so; and 4 = very much so. For the trait-anxiety and -anger scales, subjects report how they “generally” feel by rating themselves on the Likert type four-point frequency scale where: 1 = almost never; 2 = sometimes; 3 = often; 4 = almost always. The scoring weights for items on which high ratings indicate the presence of high levels of the emotion are the same as the number for the item on the form. However, for items on which high ratings indicate the absence of the emotion, the scoring weights are reversed (Spielberger et al., 1970).

The state-trait personality inventory has been used widely with different populations, including patients recovering from an acute myocardial infarction (Rose et al., 1994); AIDs workers (All and Fried, 1996) and mothers of term and preterm infants (Gennaro, 1985; Gennaro, 1988).

4.12 Stress Arousal Checklist (SACL)

The Stress Arousal Checklist (SACL) is a psychometric instrument developed by an Australian Geoffrey Gotts and the Brition Tom Cox (1988) in the Stress Research Unit at the University of Nottingham, to provide a reliable assessment of self-reported mood during stressful conditions. The SACL provides measures of self-reported stress and arousal regarded as two fundamental aspects of mood and also provides a measure of the certainty with which the person can self-report on their mood. The subjects have to report how they feel “right now” and thus constitute an assessment of present state.

The first dimension, stress, relates to feelings of pleasantness-unpleasantness or hedonic condition (e.g. tense, bothered, uncomfortable) (Thayer, 1978; Cox, 1985). The second dimension, arousal, is related to the physiological and behavioural states of attentiveness and wakefulness (e.g. alert, lively) (Thayer, 1978) and it provides an indication of the person's energy level. The stress factor can be envisaged as an internal response to the perceived favourability of the external environment and the arousal as an internal representation of the autonomic and somatic activity (Mackay et al., 1978). These two factors are responsive to a variety of effects e.g. environment, task and drugs. For example, after a prolonged and boring repetitive task a significant increase in self-reported 'stress' and a significant decrease in self-reported 'arousal' were found (Mackay et al., 1978).

The SACL was developed from Thayer's Activation-Deactivation Adjective Checklist (AD-ACL) which was based on 'mood' describing adjectives of Nowlis (Thayer, 1967). The final form of AD-ACL instructs subjects to respond to each of a list of adjectives on the basis of how well the adjectives describe their feelings at the point in time. The final version of Thayer's AD-ACL was found to be too American in their orientation. Therefore the list of Thayer's original adjectives was removed and replaced by new words suitable for a British population. This 45-item inventory was then administered to 154 undergraduate students (ages not specified) and factor analyses and orthogonal rotations were performed on the data to produce a 34-item adjective list. The 34 items were further administered to normal adult working populations, and using higher cut-off factor loadings of above 0.04 criteria and the ease with which the adjectives could be understood, a 30-item version was adopted (Gotts and Cox, 1988).

The SACL is a reliable brief scale that has demonstrated factorial robustness across diverse samples (e.g. age, sex, education level, ethnic origin, occupation) (Gotts and Cox, 1988). Factor analyses of the SACL have shown a two factor solution as most appropriate. The adjectives of factor one clearly define the stress dimension of mood and the second factor adjectives define the arousal dimension of mood. The relative strength of the different-score factors, in terms of variance was 22.7% of stress variance, 9.9% of arousal variance and 32,7% for total variance (Gotts and Cox, 1988).

The factors are bipolar, with some adjectives loading positively and some negatively. The 30 items consist of 18 (10 positive and 8 negative) items that load on the stress factor and 12 items (7 positive and 5 negative) loading on the arousal factor. Thayer's original asymmetric response scale was used: 'definitely feel' (++), 'feel slightly' (+), 'do not understand or uncertain' (?), and 'definitely do not feel' (-). There are two forms of scoring, short and long scoring. For the short scoring, the response scale is dichotomised and the two halves are scored either '0' or '1' according to whether the adjective is positive or negative. The long scoring is computed by scoring the individual response categories on a 1 to 4 Likert type scale. Positive adjectives are scored from 1(-) to 4(++), while negative adjectives are scored from 1(++) to 4(-). The alpha coefficient was 0.89 for stress and 0.84 for arousal. The SACL has been used widely in different populations and situations (Burrows et al., 1977; Cox and Mackay, 1985; Ray and Fitzzibbon, 1981).

4.13 Ways of Coping Checklist (WCCL)

Many investigators have studied the coping strategies of people in stressful events by using the WCCL that was derived by Aldwin et al. (1980) from Lazarus' transactional model of stress and coping (Lazarus and Folkman, 1984). The 68-item in the original WCCL describe a broad range of behavioural and cognitive coping strategies that are relevant in stressful situations. The items were originally designed to differentiate the two broad ways of coping strategies as defined by Lazarus (1966, 1984): (1) problem-focused coping aimed at changing the stressful situation, and (2) emotion-focused coping aimed at reducing the emotional intensity. The problem-focused category includes items describing cognitive problem-solving efforts and behavioural strategies for altering or managing the source of the problem. The emotion-focused category includes items that divert attention from the source of distress. It describes efforts to escape through wishful thinking. The WCCL requires participants to indicate what they thought and did in recent encounters and then to apply the concepts of coping to these statements (e.g. "I bargain or compromised to get something positive from the situation", "Talked to someone to find out more about the situation", "I hoped a miracle would happen", "I carried on as if nothing had happened"). By using recent encounters the problem of memory and retrospective falsification is minimised. Vitaliano and colleagues (1985) revised the original WCCL and through a series of factor analyses have further identified eight subscales: (1) confrontative, (2) distancing, (3) self-controlling, (4) seeking social support, (5) accepting responsibility, (6) escape-avoidance, (7) planful problem solving, and (8) positive reappraisal.

Folkman and Lazarus (1980) used the WCCL on a study of 100 community residents aged 45-64 years who described their efforts to cope in different situations in the course of the year. They found that 98% used both problem-focused and emotion-focused solving strategies and this confirmed the importance of viewing both problem-focused and emotion-focused strategies in attempts to cope with stressful situations. Further, Lazarus and Folkman (1980) commented that conceptualising coping only in terms of either defensive processes or problem-solving processes is inadequate. In situations that had to be accepted they found that men used more problem-focused strategies than women. They also found that it was the context of the situation and not the person that influenced the coping responses.

Vitaliano and colleagues (1985) examined the psychometric properties of the 68-item WCCL versus the 43-item. Four psychometric properties were studied including the reproducibility of the factor structure of the original scales, the internal consistency reliabilities and intercorrelations of the original and revised scales, the construct and criterion-related validities of the scales, and the relationships of the scales to demographic factors. These properties were studied on three different populations: 83 psychiatric outpatients aged 25-40 years, 62 spouses of patients with Alzheimer's disease aged 57-72 years, and 425 medical students (255 male, 170 female) aged 23-29 years. They found that the revised scales were consistently shown to be more reliable and to share substantially less variance than the original scales across the three groups. In terms of construct validity, anxiety and depression was found to be negatively related to the revised problem-focused scale consistently across the three groups and as for the concurrent validity of the scales the medical students in group therapy had significantly higher original and revised scales scores than students not participating in the group therapy. Both the original and revised scales were shown to be free of demographic biases.

4.14 Social Support Questionnaire (SSQ)

According to Sarason and colleagues (1983), regardless of how social support is conceptualised, it has two basic factors: (1) the perception that there are a number of available others to whom one can turn to in times of need, and (2) a degree of satisfaction with the available support. An instrument that has been used to assess this feature of perceived social support is the Social Support Questionnaire (Sarason et al., 1983). The basic assumption for the choice of perceived support measurement is that it taps into the availability of resources provided through social relationships that should help the person to cope with acute or chronic stressors (Wills and Shinar, 2000). The perceived support availability has been showed to relate to lower levels of physical morbidity (Orth-Gomer et al., 1993), psychological distress (Vaux, 1988), and buffering effects (Cohen and Wills, 1985; Falk et al., 1992). Thus perceived support availability is known to be of considerable significance for health.

The original SSQ, developed in 1983, was influenced by Bowlby's (1969) theory of attachment and Sarason's (Sarason et al., 1990) theory of acceptance. The instrument yields two scores. The number of and availability of perceived persons score (SSQN) represents the number of persons perceived to be available as potential supporters across 27 different situations. Subjects respond to each item by listing the name of up to nine individuals to whom they believe they could turn to in that particular situation. The satisfaction score (SSQS) reflects how satisfied the subject reports being with the perceived available support.

To assess social support the original 61-items of different situations in which social support might be sought was piloted to several hundred college students (Sarason et al., 1983). The students were asked to list for each item all of the individuals who provided them with support in the situation described and also rated their level of satisfaction with the support received. Items were analysed and those that showed poor correlation with other items were eliminated. The 27-items of the SSQ were developed from the pilot work and consists of two parts. The items ask the subjects (a) to list the people to whom they can turn and rely on in various situations, and (b) to indicate how satisfied they are with these social supports. The number (N) score for each item of the SSQ is the number of support persons listed and the satisfaction (S) score reveals how satisfied the individual is with the perceived support in each situation. It is rated on a scale between 1 and 6 from “very satisfied” to “very dissatisfied”. The 27-item SSQ was administered to a sample of 602 University of Washington under- graduates. The alpha coefficient of the number of people score was 0.97 and the satisfaction score was 0.94.

To reduce the number of items from the 27-item SSQ, three items were chosen from the 27-item SSQ on the basis of both correlations with SSQ Number and Satisfaction scores, and representativeness of item content. This short form SSQ3 and the SSQ27 were administered to a sample of 182 male and female under- graduates. Of these, 47 female and 29 male were tested only once and 61 female and 45 male were tested and retested to provide test-retest data on the SSQ3. The internal reliabilities of SSQ3-Number were 0.75 and SSQ3-Satisfaction 0.79 which was lower than SSQ27 of 0.97 and 0.94 respectively. Because of the low internal reliabilities of SSQ3, the SSQ27 was administered to three independent samples. Sample one consisted of 182 under-graduates, 108 female and 74 male; sample two, 81 male and 136 female undergraduates; and sample three, 59 male and 87 female. Sample one completed the SSQ27, sample two completed the SSQ27 and three other measures of social support including the Social Network List (Stokes, 1983), Inventory of Socially Supportive Behaviours (Barrera et al., 1981), Family Environment Scale (Moos and Moos, 1981) and sample three completed the SSQ27 and two other measures of social support including the Interpersonal Support Evaluation List (Cohen et al., 1985), and the Perceived Social Support Measure (Procidano and Heller, 1983). Factor analyses were used to analyse the data. The outcome was the 6-item SSQ.

The abbreviated instrument, the 6-item short form of the SSQ which was derived from the 27 items, appears to be highly similar to the 27-items version in the correlation of the two scores (Sarason et al., 1983). The internal reliabilities for SSQ6 ranged from 0.90 to 0.93 for both Number and Satisfaction respectively. The SSQ6 is psychometrically sound and when time availability for administration is a consideration, the SSQ6 is an acceptable substitute for the SSQ 27-items version (Sarason et al., 1987). All the items on the SSQ6 are of a very general nature and reflect the affective aspects of relationships. Each item has two parts and the first part assesses the number of available others the individual feels he or she can turn to in times of need in each of a variety of situations (number of perceived availability score) and the second part measures the individual's degree of satisfaction (satisfaction score) with that perceived support available in that particular situation. Subjects indicate how satisfied they are with that perceived social support in that situation on a 6-point Likert scale from 1= very dissatisfied to 6 = very satisfied.

The SSQ6 has been used widely including on patients with various psychiatric disorders (Furukawa et al., 1999); and patients suffering from chronic pain (Gil et al., 1987).

4.15 Dyadic Adjustment Scale (DAS)

Spanier (1976) developed the Dyadic Adjustment Scale to measure the quality of married and unmarried cohabiting relationships. The instrument is designed to measure the degree of satisfaction of married and unmarried cohabiting couples on 31 aspects of marital interaction and on one global item of "overall happiness". The 32-item scale consists mainly of 6-point Likert scale-type rating scales with four subscales: Dyadic Consensus (13 items concerning the extent of agreement or disagreement between partners on issues such as finances, recreation, religion); Dyadic Satisfaction (10 items concerning overall happiness and satisfaction versus frequency of quarrelling, getting on partner 's nerves); Dyadic Cohesion (5 items concerning frequency of joint partnership in activities such as working on a project) and Dyadic Affectional expression (4 items concerning sex, love and affection).

The DAS is designed to serve a number of different needs. For those wishing to use an overall measure of dyadic adjustment, the 32-item scale can be completed within a few minutes. The scale was administered in Australia to 218 married couples and 94 divorced couples to test its reliability and validity (Antill and Cotton, 1982). For its content validity, the scale was evaluated by three judges and found to be a relevant measure of dyadic adjustment for contemporary relationships. For its criterion-related validity, the scale was found to correlate significantly with the external criterion of marital states. In other words, there was a significant difference between the scores of married and divorced subjects. To assess its construct validity of whether it measures the same general construct as an alternative well-accepted marital adjustment scale the Locke-Wallace Marital Adjustment Scale, the correlation between the scales was found to be 0.86. To test its reliability, the alpha coefficient was 0.96 (Spanier, 1976). A total of 545 couples (453 married, 48 cohabiting, 29 separated and 15 divorced) representing

Australian society completed the short form of DAS, six items and one global item of “overall happiness”. The alpha reliability coefficient of the DAS was 076 and is considered acceptable for an abbreviated screening test (Anastasi, 1982).

Sharpley and Cross (1982) examined Spanier’s original DAS regarding its psychometric properties, verification of the original results and conclusions. Ninety-five married persons (58 women, 37 men) completed the DAS. They found the 6-items reliability was 0.96 which exactly replicates Spanier’s (1976) results. Using discriminant analysis, Sharpley and Cross (1982) found 92% of cases were correctly classified. The one global item “overall happiness” showed 65% of cases to be classified correctly and 75% of the variance in the corrected total score. They concluded that for rapid screening, the one global item would be sufficient. The short form DAS has been used in recent studies during pregnancy and in the postnatal period (Johanson et al., 2000; Morse et al., 2000).

In the present study, to determine whether there will be a change in the parental partners relationship in both parents of preterm and term infants during the first week of the birth of the infant and 16 weeks after the infant’s discharge home the one global item “overall happiness” of the relationship was used.

4.16 Beck Depression Inventory (BDI)

The BDI has been viewed as one of the better self-report measures of general depression and has been used widely in clinical research (Reynolds and Gould, 1981). Beck and colleagues (1961) developed the BDI which consists of 21 items, each corresponding to a specific category of symptoms and attitudes of depressed mood. It was based on responses from an initial sample of 997 psychiatric inpatients and outpatients. Each item consists of four alternative statements graded in severity and scored from 0 to 3. Beck and colleagues (1961) reported a split-half reliability of 0.93.

Beck, A and Beck, R (1972) developed a shorter form of the BDI, a 13-item inventory for use as a rapid screening instrument in clinical settings of general practice. Beck, A and Beck, R (1972) found that the short-form of the depression inventory was satisfactory, correlating 0.96 with the 21-item inventory and 0.61 with the clinician's ratings of depression.

The standard 21-item and short 13-item forms of the BDI were further investigated for their reliability and validity on a sample of 163 individuals (116 male and 47 female) who were involved in a methadone maintenance drug rehabilitation program in New York and who were a moderately depressed group involved in a clinical intervention program (Reynolds and Gould, 1981). A random subsample of 32 subjects also completed the Self-Rating Depression Scale developed by Zung (1974) and the UCLA Loneliness Scale (Russell et al., 1978). The Internal consistency reliabilities of the criterion variables were for Zung r =0.72 and UCLA Loneliness r =0.92. The alpha coefficient was 0.85 for the standard form and 0.83 for the short form. The correlation between the standard and short forms was found to be 0.93. Knight (1984) reported a general health survey study in New Zealand where 1091 subjects completed the short form BDI without omitting any items and found the alpha coefficient of the short form BDI was 0.81.

The standard and short form of the Beck Depression Inventory has been found to be reliable and valid measures for the assessment of depression. The instrument has been used in several studies of postnatal depression (Field et al., 1985; Atkinson and Rickel, 1984; Hoffman and Drotar, 1986).

4.17 Parental Stress Scale: Neonatal Intensive Care Unit (NICU)

For parents of premature infants studies have suggested that the NICU environment may be an additional source of stress (Paludetto et al., 1981; Yu et al., 1981). The environmental stressors include the equipment surrounding the infant such as the respirators, cardio-respiratory monitors and the sights of other small and sick infants observed during visiting times (Miles et al., 1991). Carter and Miles (1989) studied the sources of stress for parents having a child in the paediatric intensive care unit (PICU) and developed an instrument to systematically measure the stressors. These include the sights and sounds of the unit, the child's appearance and behaviours, procedures done to the child, staff communication and relationships and delays in being allowed to perform parental role.

Miles and colleagues (1991) adapted an instrument from the Parental Stressor Scale: PICU (Carter and Miles, 1989) and used it to assess the impacts on the parents from the stressors in NICU. The instrument was conceptually designed to measure parental perception of stressors arising from the four aspects of the NICU environment: (1) sights and sounds of the nursery, (2) infant's appearance and behaviour, (3) feelings relating to the delay in performing parental roles, and (4) staff communication and relationships.

The PSS:NICU (Miles, 1987) consists of 46 items conceptually grouped into the four dimensions sights and sounds of the nursery (5 items) and includes potential stressors arising from the appearance and sounds of the NICU environment (e.g. the presence of monitors and equipment, the constant noises of monitors and equipment); (2) Infant appearance (19 items) measured stress related to the appearance and behaviour of the infant surrounded by monitoring equipment (e.g. tubes or equipment on or near by baby, my baby being fed by an intravenous line or tube); (3) Delay in performing parental roles (11 items) measures stress related to delay in performing normal care giving activity (being separated from my baby, not feeding my baby myself); (4) Staff communication and relationships (11 items) measures stress related to the staff behaviour and interaction with the parents (e.g. staff explaining things too fast, staff used words I don't understand). In completing the instrument, the parents are asked to rate each item on 5-point Likert-scale ranging from 1 (not at all stressful) to 5 (extremely stressful) and parents circled "0" for items they did not experience. An additional final item asks the parent to indicate how stressful the total NICU experience has been on a scale of 1 to 5 where 1 = not at all stressful to 5 = extremely stressful (Miles et al., 1991).

The internal consistency alpha for sights and sounds of the unit was 0.74, for the infants' appearance and behaviour was 0.87, for experiences arising from delay in performing parental roles was 0.80, and for the perceived quality of staff communication and relationships it was 0.81. For construct validity, Pearson correlation coefficients were computed between each of the experienced subscores and the overall NICU stress scores, together with state and trait anxiety scores. There were statistically significant relationships between the total experiences of stress scores and both trait ($r = 0.21$, $p < 0.05$) and state anxiety ($r = 0.52$, $p < 0.0001$) scores. Overall stress scores on the PSS:NICU also correlated significantly with both trait ($r = 0.32$, $p < 0.001$) and state ($r = 0.55$, $p < 0.001$) anxiety scores (Miles et al., 1991).

Advances in medical technology over the last two decades impact on the work in a tertiary special care nursery making it possible today to provide care for smaller (e.g. < 30 weeks gestation) and sicker infants. Although the intensity of the environment of SCN is different from NICU, some aspects such as the sights and sounds of the monitoring equipment (e.g. sudden alarm from the cardio-respiratory monitor), infants appearance and behaviour (e.g. small size of the infant) delay in performing parental role (e.g. separation from the infant) and staff relationships and communication (e.g. medical and nursing staff using words that are unfamiliar for the parents) are similar. The PSS:NICU scale was adapted for use in SCN for the purposes of this present study. Modifications were based on observations made in SCN and two items including the presence of respirator and chest drain were removed from the questionnaire because all infants requiring respirator support or having a chest drain in situ would be nursed in NICU and therefore not directly relevant for this study.

4.2 **Objective measures**

The literature review for biochemical markers of stress was also scanned using the Ovid technologies program for a formal search of MEDLINE and CINAHL. Text terms used to compile the literature review were “cortisol”, “monoamine oxidase inhibitor”, and “tribulin”. The search results were linked to “animals as well as human” because animals were first used for research in this field. The limit of the search was to “English Language” only. The electronic database for this search was between 1980-2000 because the method of obtaining salivary cortisol and tribulin as a stress free procedure for measuring stress in human was carried out in the 1980s. Cross references were used to further the search. Well-known endocrinology and physiology textbooks were also used as source texts. Experts in the field were consulted through the internet and also personal communication with Professor Trevor Norman, a biochemist specialising in this field of research in Melbourne, Australia, who is a recognised expert with an international reputation.

There is strong evidence that a relationship exists between perceived stress and raised levels of biochemical markers of cortisol and monoamine oxidase (MAO) inhibitory activities (tribulin) (Kahn et al., 1988; Doyle et al., 1996). Therefore, ways to monitor biochemical indices of stress effects may be done by measuring the levels of cortisol and MAO inhibitory secretions in relation to stressful events.

4.21 Cortisol

Cortisol has been shown to be essential for the physiological and biochemical adaptive response mechanism to stress and therefore for understanding the internal equilibrium of an individual (Muccutcheon and Oldfield, 1992). Thus, cortisol plays an important part in the individual response to exogenous and endogenous stressors. Typically, salivary cortisol concentrations will peak in 10 to 20 minutes following an acute stressor (Kirschbaum et al., 1993). The circadian pattern of cortisol is characterised by one in which the peak concentrations occur prior to or at the time of awakening in the morning with a gradual decline over the 24 hour period (Krieger, 1979). Therefore, cortisol is known to have a very strong diurnal cycle where levels are highest in the morning and decrease throughout the day to reach a nadir around 8-9 pm (Kirschbaum and Hellhammer, 1989; Ockenfels et al., 1995). It has been reported that in addition to the circadian pattern, there are superimposed episodic relatively synchronous peaks throughout the day and the majority of such episodes occur at the time of the normal circadian rise and in relation to meal times (Krieger, 1979). The amount of cortisol synthesised daily in healthy individuals is 5 to 7 $mg/m^2/day$ (Toates, 1995). The overall effect of prolonged stress is to blunt the excursion of the circadian rhythm by increasing the nocturnal plasma cortisol levels, resulting in a concomitant reduced change in the morning levels (Toates, 1995) and a prolongation of high levels beyond the expected evening nadir.

Cortisol is secreted in an unbound state, however it binds to plasma proteins mainly to globulin and to a lesser extend to albumin (Greenspan, 1991). It is the non-protein bound cortisol which is present in the saliva and the best indicator of psychological stress. The normal values at 8 am are 16 $\pm$ 8.2 nmol\L (range 6.4 to 32.2 nmol\L) for men and 9.8 $\pm$ 3.1 nmol\L (range 4.8 to 18.2 nmol\L) for women; the values at 8 pm for men and women are 3.9 $\pm$ 0.2 nmol\L (range 2.2 to 4.2 nmol\L) (Orth et al., 1992; Laudat, 1988).

Sex differences in cortisol responses to physiological stress have been noted. Kirschbaum and colleagues (1992) found consistent differences in the adrenocortical stress response between healthy males and females in four independent studies. They found that the males always release 1.5-2 fold more cortisol than females following psychological stress. Even if the males only anticipated the stress without subsequent exposure, their cortisol levels were higher than the females.

McMillen and colleagues (1993) carried out a study at the Monash Medical Centre, Victoria, Australia to compare the effects of the demands of term and preterm infants sleep-wake behaviour and salivary melatonin and cortisol concentrations in mothers for up to five months after birth in the term group or following arrival of the infant at home in the preterm group. Twenty three term and 22 preterm babies and their mothers were recruited into the study. They found that although there were relatively small differences between the term and preterm infants in the daily patterns of sleep-wake behaviour, there were marked differences in the maternal sleep-wake parameters. For the first eight weeks, mothers of preterm infants spent 30-40% of time awake compared to 20-30% of mothers of term infants. The salivary cortisol levels were significantly higher in the mothers of preterm infants throughout the 10-week study period, and the peak in salivary cortisol levels occurred between 2 am and 10 am in both term and preterm groups. It appears that mothers of preterm infants are not only exposed to greater physiological disruption but also indicate psychological stress according to the high levels of salivary cortisol. Kirschbaum and colleagues (1995) studied 20 healthy male subjects who were exposed five times to the same, brief psychological stressor with one stress session per day. They found that cortisol levels were significantly elevated on each of the five days. The mean response time decreased from day one to day two with no further attenuation observed on the remaining days.

The best indicator of adrenal glucocorticoid activity is the plasma free cortisol (non-protein-bound) measurement since it represents the biologically active form of circulating hormone (Kahn et al., 1988). However, there are problems associated with this method. The cortisol in the blood is largely bound to plasma proteins (globulin and albumin) and plasma sampling is an invasive and stressful procedure for the subject particularly when sequential sampling over time is required. Cortisol can also be collected from the urine. There are problems associated with urine sampling where the sample is confounded by both the issues of in vivo storage and circadian variation (Doyle et al., 1996). As a spot urine sample is typically obtained from a stored pool of urine, the 24 hour time sample lacks temporal association with the stress experiences. Salivary cortisol values have been found to correlate closely with plasma free cortisol values in the newborn (Gunnar et al., 1989; Gunnar, 1992), in children and adolescent (Woodside et al., 1991) and in elderly subjects (Reid et al., 1992). The correlation coefficients in healthy elderly subjects between cortisol in saliva and plasma was r =0.96 (Kirschbaum and Hellhammer, 1994).

Earlier studies measuring cortisol secretion have relied on serum and urine cortisol measurements, but recent advances in salivary cortisol assays have demonstrated a salivary sample to be a simple, noninvasive procedure (Dyas et al., 1986). The acinar cell lining the salivary glands prevent proteins and protein-bound molecules from entering the saliva and therefore the cortisol is of the unborn free hormone fraction (Kirschbaum and Hellhammer, 1994) that provide acceptable reliability.

Therefore, the collection of saliva for cortisol and tribulin analysis has increasingly been used during the last decade or so (Kahn et al., 1988; Doyle et al., 1996), as apart from being a simple and stress-free procedure it is able to be collected simultaneously with self-reported evaluations of the stress experience.

4.22 Monoamine Oxidase (MAO) Inhibitor (Tribulin)

Monoamine oxidase is present in the outer mitochondrial and nuclear membranes of the brain at synaptic endings (Muller and Nistico, 1989). MAO, a flavoenzyme is responsible for the metabolism of both endogenous and exogenous biogenic amines (Finch et al., 1995). MAO exists in two forms (A and B), differentiated according to the sensitivity of the enzyme to inhibitors. Glover and colleagues (1980) reported the presence of endogenous urinary monoamine oxidase inhibitory activity and Sandler (1982) named this activity *tribulin*, the production of which appears to be increased in a variety of conditions associated with anxiety or stress. The research linking tribulin and stress is still in an early stage and the functional importance of tribulin is not yet clear (Glover and Sandler, 1990). However, Glover and Sandler (1990) stated that it makes physiological sense that there is an increased output of endogenous MAO inhibitor during stress to conserve catecholamines and delay their further metabolism. Clow and colleagues (1988a) reported elevated urinary tribulin levels in patients suffering from generalised anxiety disorder and also reported that subjects with panic disorder showed increased levels of urinary tribulin levels compared to controls (Clow et al., 1988b). Doyle and colleagues (1996) studied 11 students (9 female, 2 male) taking salivary samples at 30 minutes prior to an oral seminar presentation, immediately following the presentation, 20 minutes and 40 minutes after the oral presentation. The students completed the Stress/

Arousal Checklist that is 30 adjectives of mood. The salivary samples obtained at the four time periods correlated with the self-reported stress which was highest before the presentation and at the presentation, before declining at the two post-presentation periods. They also found a strong relationship between salivary MAO A and B inhibitory activities and stress.

It has been reported that a relaxation phase of MAO-AI is an inhibition of 25% to a peak of just over 50% immediately following a stressor (Hucklebridge et al., 1998).

4.23 Relationship between cortisol and tribulin

Response to highly stressful conditions involves increased sympathetic-adreno medullary activity, increased hypothalamic-pituitary-adrenal cortical activity and also enhanced turnover of the brain monoamine (Dantzer, 1989). Clow and colleagues (1997) studied the temporal relationship between changes in salivary cortisol and salivary monoamine oxidase inhibitory (MAO-AI) activity during an acute psychological stress challenge. They found that both cortisol and endogenous MAO-AI were increased by the stressor. However, they found that a cortisol response peaked 12 minutes after the end of the stress challenge but MAO-AI peaked 12 minutes prior to the cortisol peak which must be during the time of the stress challenge. This indicates that endogenous generation of MAO-AI may be a primary event in stress-induced activation of the HPA axis and therefore a normal homeostatic regulatory mechanism. Cortisol has been shown to exhibit a marked circadian pattern of activation with high levels in the morning and low levels in the evening and night (Guyton, 1991; Ockenfels et al., 1995). A burst of cortisol activity occurs during the 30 minutes after awakening (Prussner et al., 1997), then falls fairly steeply during the morning with a more shallow decline in the afternoon and evening. Hucklebridge and colleagues (1998) examined the relationship between MAO-AI and the salivary cortisol response to awakening and also determined the diurnal pattern of MAO-AI and salivary cortisol. They found significant patterns of response to awakening and temporal relationships between cortisol and MAO-AI. They found peak MAO-AI preceded the cortisol peak by 10 to 15 minutes. They also found both cortisol and MAO-AI followed a similar pattern of decline over the course of the day.

4.3 **Sampling procedure and storage of biochemical markers of stress**

A convenient and hygienic sampling device called “Salivette” (Sarstedt Inc., Rommelsdorf, Germany) was used. The salivette consists of a small cotton swab, which fits inside a standard centrifugate tube. It facilitates pipetting of the sample since the debris is separated from the clear watery saliva. The cortisol assays were determined using a radioimmunoassays commercial kit (Coat-A Count ^{R}, Diagnostic Products Corporation, CA, U.S.A.) (Appendix B). The tribulin assays were determined by measuring its inhibition of MAO (Appendix B).

Kahn and colleagues (1988) studied the effect of storage of the saliva under various temperature conditions. Samples were obtained from 28 volunteers (11 women and 17 men) aged 21-55 years from the staff of the Biological Psychiatry Branch, NIMH. Each sample was divided into two fractions, one of which was centrifuged immediately. The spun and the unspun fractions were subsequently divided into three aliquots, which were kept, respectively at room temperature (20^{o}C), in the refrigerator (4^{o}C), and frozen (-70^{o}C) for 2 weeks prior to assay. They found that the saliva concentrations did not appear to be affected by the storage temperature nor by immediate or delayed centrifugation of samples. Kirschbaum and Hellhammer (1989) and Leonard and colleagues (1991) have also shown that saliva samples can be stored at 20^{o}C for up to four weeks without significant reduction in the cortisol levels.

Kirschbaum and Hellhammer (1994) have suggested that even longer periods of storage at room temperature of up to 16 weeks can be achieved by adding 10g/L of citric acid to the samples or by the use of citric-acid treated “salivette” devices. However, they recommended that caution must be taken when analysing citric-acid saliva samples because in some immunoassays a low pH results in false high cortisol levels. They suggested running parallel analyses on acid-free saliva samples to show that the assay is unaffected by the acid.

4.4 **Summary**

To compare the subjective feelings and moods of parents having preterm and term infants the State-Trait Personality Inventory and the Stress/ Arousal Checklist were used in the present study and to find out how parents cope in a stressful situation the revised version of the Ways of Coping Checklist was used. Adequate social support affects the ability of an individual to cope with a stressful situation and the Social Support Questionnaire was used to assess the parents' perception of the number of supporters available to them, as well as providing as assessment of the degree of satisfaction with the available support. The Beck and Beck Depression Scale-Short Form was used to determine whether the mothers of preterm and term infants were depressed with the birth of the infants. The one global item of Dyadic Adjustment Scale "overall happiness" was used to compare the relationship between parental partners of both preterm and term infants during the first postnatal week and 16 weeks after discharge of the infants were from the hospital. The Parental Stress Scale: Neonatal Intensive Care Unit which was adapted for use in special care nursery was utilised to determine the stressors perceived by these parents (mothers and fathers) of premature infants admitted to the special care nursery. All these instruments have been chosen because of their reliabilities and validities and that they have been used widely.

There is strong evidence that a relationship exists between perceived stress and raised levels of biochemical markers of cortisol and monoamine oxidase inhibitory activities. Therefore, ways to monitor stress effects may be done by measuring the levels of cortisol and MAO inhibitory secretions in relation to stressful events. There is also evidence to show temporal relationships between cortisol and MAO-AI and also both cortiosl and MAO-AI followed a similar pattern of decline over the course of the day. The findings that salivary cortisol concentrations do not appear to be affected by the storage temperature nor by the immediate or delayed centrifugation of samples, this procedure can be used in field studies.

The next chapter discusses the methodological issue in a research study.

Chapter 5

Methodological issues in a research study

5.1 **Research design**

The design of a research study is the basic outline of the study, specifying how the data will be collected and analysed and by judicious selection of strategies, how to control for unwanted variations. The research question dictates the type of design and the design determines whether the research question will be answered. A true experimental design has three criteria that it must met (Christensen, 1991; McBurney, 2001). The first criterion is whether the design answers the research questions, or adequately tests the hypotheses. The second is whether extraneous variables have been controlled. This criterion relates to the concept of internal validity and can be achieved by randomisation techniques or by use of a control group. The third criterion is whether the findings can be generalised to the population, termed ecological validity. However, a study involving humans seldom satisfies simultaneously all these three criteria. Many methodological flaws are to be found in these attempts, the most common of which include limited information of subject selection, how the extraneous variables are controlled, the use of instruments with untested reliability and validity and unsound research design.

Subject selection is a very significant aspect in a study. In an attempt to conduct a controlled comparison of therapy all participants should be drawn from the same population of interest, according to the predetermined inclusion and exclusion criteria. In order to conform to true experimental design, the two most important principles are the use of a randomisation technique and comparison with control groups.

5.11 Randomisation technique

Randomisation is an attempt to ensure that each subject has an equal and independent chance of being assigned to every group condition. Ways of ensuring this include use of random-number table, toss of a coin, or use of repeated designs, where every subject is exposed to every condition in a counterbalanced way to reduce the carry over effect of the previous condition. However, there are studies where the investigators have no control over the assignment of subjects to conditions. For example, to determine whether the parents of preterm infants admitted to SCN have higher stress levels than parents of term infants, it is impossible to assign participants to the two groups but instead it is necessary to select subjects from preexisiting groups. The inability to randomly allocate subjects to groups reduces the internal validity of the study but does not necessarily render it invalid. It is true that it is better to carry out a true experiment rather than a quasi-experiment. However, this might not be possible and therefore, the crucial point is to choose the best research method that will best answer the research question.

5.12 Control group

In the field of research, the word “control” has three meanings (Christensen, 1991; McBurney, 2001). First, control provides a standard against which to compare the effect of an independent variable. This concept is essentially a way of establishing that the two groups in a research are identical except for the variable of interest. A necessary requirement of the control group is that the subjects in the group be similar to those in the experimental group. The subjects in the two groups must be similar so that theoretically they would produce the same results in the absence of the introduction of the independent variable. For example, Group A receives treatment (experimental group) and Group B receives no treatment (control group). The control group serves as the basis of comparison for the experimental treatment, then any post-experiment difference between the two groups can be attributed to the treatment. In the present study, the experimental or target group is made up of the parents of preterm infants and the control group is the parents of term infants.

Secondly, the word control is distinct from the first meaning but closely related and is defined by McBurney (2001) as any means used to rule out possible threats to the variability of a research. To control constancy of potential extraneous variables is often relatively easy to accomplish once the extraneous variables have been identified. Frequently, the difficulty is identifying these variables. The two meanings are related in the following way. The first meaning allows one to conclude that a dependent variable is associated with an independent variable and the second meaning facilitates drawing this conclusion by controlling for the effect of extraneous variable which has the effect of confounding the results of the research.

The third meaning of control refers to the manipulation of antecedent conditions that determine a change in behaviour. When the antecedent conditions are known, they can be manipulated so as to produce the desired behaviour. This concept has been attributed to psychologist such as BF Skinner (Skinner, 1971).

They are ways of achieving the desired level of control. First, control can be attained through an appropriate design of the study. For example, a repeated measures design where all the subjects are repeatedly measured under each treatment condition. In this design, the subjects serve as their own control and variables such as gender and age remain constant over the whole experiment. Since the subjects serve as their own control, the subjects in the various treatment conditions are watched which will increase the sensitivity of the experiment. Second, control can be attained by making statistical adjustments during data analysis by using techniques such as analysis of covariance on any variable that may show differences between the two (or more) groups (e.g. age, education, parity).

5.2 **Longitudinal design**

When studying the behaviour of a group, the two main sources of variability are the inter-individual variability (between individuals) and intra-individual variability (within individuals) (Nesselrode and Featherman, 1991). A design that can deal with these variabilities is the longitudinal design which allows careful monitoring of variability in individual behaviour and also leads to the discovery of the sources of variability in an individual. As Chassan (1967, p. 182) pointed out:

> *The existence of variability as a basic phenomenon in the study of individual psychopathology implies that a single observation of a patient state, in general, can offer only a minimum of information about the patient state. While such information is literally better than no information, it provides no more data than does any other statistical sample of one.*

Longitudinal designs require repeated sequential measurements of an individual or group of individuals over a predetermined period of time (Wu et al., 1999). Such designs are well suited to studying the effects of individual change over time, including the effects of changing emotions, moods, and circadian rhythms, as well as the impact of social context changes on the individual(s) concerned. To examine changes in individuals over time, the data are collected over a given time period, determined a priori, by measuring usually the same key variables, at least more than once and usually several times.

5.21 Advantages of longitudinal design

The main advantages of this design are (i) being able to monitor the impact of events on the individuals over time on responses, usually in natural or experimental/laboratory settings; (ii) allowing the researcher to examine subtle changes in behaviours, and (iii) observing the psychological (i.e. social, physical) impacts of life events on individuals' experiences. For example, in the present study the issue of central interest is the impact of premature birth on the parents concerned. In this present study, a longitudinal repeated measures design was utilised to study the impact of premature birth on the parents from the early hours post-delivery (Time 1), through the extended hospitalisation of the infant in a special care nursery that necessitated the separation of the infant from his/her parents (Time 2 and Time 3), to the early days post-discharge when the parents assume a belated parenting role in their own home (Time 4), to a longer term follow up for evaluation of outcomes in adjustment to the parenting role (Time 5).

An example of the advantages of a longitudinal study compared to other study designs was the Tucson epidemiological study (Sherrill et al., 1994) of obstructive airways disease, in which the effects of smoking onset and cessation were assessed on changes in pulmonary function. This study followed 288 subjects for 17 years. The investigators showed that the largest beneficial effect related to quitting smoking was in younger subjects rather than the older subjects because the older people had been smoking for a longer period and, finding it difficult to quit the effect decreased linearly with age at quitting. The advantage of this study over many studies in this area was that the investigators were able to account for both the age at onset of smoking and at quitting and thus give a more comprehensive picture. Another example was a study by Gennaro and colleagues (1997) of stress and immune responses in mothers of very low birth weight infants and normal weight infants. The two groups of mothers were measured for negative affect and various immune function markers at delivery of the infant and subsequently at, one, two and four months post-delivery. The mothers of VLBW infants had increased anxiety and decreased immunologic cell subsets post-delivery which may be due to hormonal factors, lifestyle changes or the stress they experienced after the birth of the VLBW infant and for the first few months of infant caretaking. The longitudinal data also showed that resolution of the immuno-suppression of pregnancy was substantially slower in mothers of VLBW infants than in mothers of normal weight infants, although neither group reached normal levels by four months. The advantage of using this design was the ability to measure repeatedly at specific times the resolution of the immune markers.

5.22 Disadvantages of longitudinal design

Recruitment and retention of an adequate number of subjects are crucial to the success of any study because the power to detect a difference after intervention or treatment is calculated based on sample size, effect size, at the conventional alpha level of 95% confidence. Recruiting subjects to a longitudinal study at the outset may be more difficult if they are forewarned about the need for commitment to future contacts. Some people may be willing to complete questionnaires at one point in time but not willing to commit themselves to more than once. This then leads to differential attrition from the study which requires pre-planning about how to manage this occurrence. This can be dealt with in practical ways (e.g. recruiting replacements). It is also necessary to identify the subjects so that they can be recontacted, thus, anonymity of responses cannot be assured totally, as the chief investigators must obtain contact details. Some people will be deterred by this especially if the topic of the study is in any way on personally sensitive issues.

Even when the subjects do agree to participate, there can be further problems. The most serious problem of a longitudinal design is attrition of the subjects or loss of subjects at different points of the study (Breakwell et al., 2000). If the attrition occurs generally from all the groups in the study, no bias would result. Unfortunately, in nearly all surveys the non-responders have different characteristics from those who remain in the study (Goldstein, 1979). Hence generalisability of the findings to the broader population may be impaired. To solve the non-responder bias is to compare their baseline characteristics with those remaining in the study, to assess the likely effect of these differences, and where appropriate to make suitable corrections. One strategy to deal with missing data can also be added using the mean values on those variable from the time before. This is possible because the characteristics of the non-responders in the follow-up stage are known because they were in the original sample. Otherwise, the results can be affected and lead to biased estimates of change.

There are many reasons why subjects are lost over time in a longitudinal design. The reasons may include residential and/or work relocation, loss of interest in the study, becoming seriously ill or death occurring from serious life events. It is clearly essential that in a longitudinal study subjects should be able to be located. One commonly utilised way of locating the subjects is by obtaining the contact details of a close member of the family (e.g. grandparent/parent) who will know of the target respondent's whereabouts during the time of recruitment. In addition, there are several ways of maintaining the interest of the subjects. The offer of financial incentives is often successful, periodic feedback of the results of the study at particular milestones is frequently valued, and sending the participants newsletters, cards on special occasions such as their birthdays and at traditional holidays e.g. New Year. As well as losing subjects, longitudinal designs are also prone to losing its research staff. This event impacts on the quality assurance of the project and should be planned for in advance by providing adequate multi-skilling training as well as familiarisation procedures for new staff.

Motzer and colleagues (1997) conducted a family research study to assess women recently diagnosed with breast cancer using a longitudinal design. This was a multicentre study where each family was followed for 10 months to examine the effectiveness of a home-based intervention program to assist child-rearing families with the impact of the mother’s non-metastatic illness on the family. The investigators reported that a great deal of effort was required to retain the families in the study and their success was reflected in the low withdrawal rate of only 11.5%. The key factors to their success in retaining the families were team selection, establishment of a bond between investigators and subjects, ongoing acknowledgments of the families participation, and systematic monitoring of the timeliness of scheduled visits. Team members selected to participate in the study were selected on their professional education and their experiences with families, knowledge of breast cancer and public health nursing. The researchers received extensive training and engaged in weekly discussions about ways of interacting with and responding to distressed families. They also considered the importance of a bond between the subjects and the study personnel and this strategy has been supported in other studies (e.g. Given et al., 1990). Each family was acknowledged over the entire course of the study, through thank you letters to each family after enrolment and after each of the four evaluation visits. A small gift was included for each child (pencils, pen, sticker, or bookmark) at each evaluation visit. Certificates of appreciation were printed with the names of younger children who participated and given to the children at the end of the last evaluation. Finally, the team members were responsible for scheduling their own family visits and allowing some flexibility in time between visits (ideally ± 2 weeks from the scheduled visit) in order to maximise retention. This range of strategies is time-consuming and requires additional expenditures but pays dividends in the quality of the study data that are obtained.

To deal with the problems of variability produced by individual differences is to measure the same individuals repeatedly over time. However, even in longitudinal designs, making multiple observations of the same subjects across time raises problems that may threaten the internal validity of the study (Breakwell et al., 2000). First, to subjects' increasing experience with taking the tests may result in improved performance on the tests overtime. This is known as the ‘carry over effect’. The solution to this problem is to allow a suitable time interval between the different measurements for delay to occur in knowledge or behaviours, or to use alternate versions of the questionnaires. The second problem concerns subject conditioning. Individuals who are studied on more than one occasion soon come to know what is required of them. To overcome this problem in treatment/intervention research, when each subject is given more than one treatment, an important principle is that subjects must not be given the same treatments in the same order. The order of the treatment is counterbalanced using a Latin Square design, that is reversing the order of the treatment across groups and statistical comparisons made. Another disadvantage is the cost issue. Longitudinal designs involve a heavy commitment of financial, personnel and infrastructure resources over a lengthy period of time. It is frequently difficult to obtain totally adequate funds at the outset and the chief investigators must resort to repeated efforts to secure additional monies to maintain the work in progress.

5.24 Distinction between prospective and retrospective longitudinal designs

An important distinction with respect to a longitudinal research strategy is consideration between a prospective and a retrospective approach

(Bergman et al., 1991). A prospective approach refers to monitoring respondents forward from a start point in time, looking forward to the outcome of the process while data are collected during the process. A retrospective approach refers to looking backwards to the past experiences and behaviours while the data are collected at the end of the process. A longitudinal study, defined as one which is based upon repeated measurements of the same individuals over time, requires the added condition of prospectively to give a true picture of cause and effect in relationships over time. It has been a widely accepted general conclusion that a prospective approach is more reliable than a retrospective one due to the known deficiencies in retrospective data gathered through recall, memory, and generalised responses. Human memory is fallible and the experience may have been forgotten or may be recalled selectively or inaccurately. These concerns have been demonstrated in experimental research (Janson, 1990). The argument that retrospective data have a lower quality than prospective data does not invalidate the retrospective research strategy *per se*. What is important is the problem under consideration and the best strategy to answer the question in the accessible and effective ways, with minimum cost.

Different findings between prospective and retrospective design are exemplified by these examples. Junge and Dvorak (2000) studied the different methodologies applied in the evaluation of football injuries as well as analysing the influence of data collection methods on the incidence of such events. Injury data were obtained weekly by a physician during one year of follow-up in 264 football players. Findings were then compared with the results of retrospective questionnaires completed by the players at the end of the observation period. In the retrospective questionnaire, the reported incidence of injuries as well as of complaints was significantly lower than that found in the weekly follow-up examinations. Retrospectively, approximately every third moderate injury and less than 10% of the mild injuries were remembered retrospectively. The shorter the period of symptoms and the length of time since the injury had occurred, the more frequently it was forgotten. Even severe injuries, such as fractures, were not reported in the retrospective reports.

A second example concerned Mefloquine, a category of drug which has been increasingly used for treatment of chloroquine-resistant malaria since its introduction in the late 1970s. In 1987 the first case of toxic encephalopathy was published, and in 1989 the World Health Organisation initiated the reporting and investigation of neuropsychiatric adverse reactions of mefloquine. Ronn and colleagues (1998) compared a prospective three year study including all patients with malaria treated with mefloquine with an earlier published, retrospective study on a comparable population covering the period up to 1989. In the retrospective study neuropsychiatric adverse effects were not specifically asked for, while in the prospective study possible adverse reactions were registered daily according to a structured questionnaire. No case of neuropsychiatric adverse reaction was registered in the retrospective study. In the prospective study, 28% had one or more neuro-psychiatric adverse reactions, although severity was mostly mild to moderate. Other adverse reactions reported were 96% in the retrospective study compared to 81% in the prospective study.

Thirdly, Aseltine and colleagues (1995) examined the correspondence between retrospective and prospective assessments of treatment outcomes among female patients treated for gynecologic symptoms (n = 800) and male patients having surgery for benign prostatic hyperplasia (n = 434). The overall health and symptom status of patients in both samples was assessed at enrolment and again at three months after treatment. At the three month follow-up, patients also were asked to compare retrospectively their current health and how they were feeling with their condition before treatment. Findings indicated that prospective and retrospective measures of change did not yield the same results. Retrospective assessments consistently produced higher estimates of the benefits of treatments.

5.3 <u>Problem of multiple comparisons</u>

The problem with conducting multiple group comparisons relates to the underlying concept of statistical analysis. Each test is based on the probability that the null hypothesis is true. Therefore each time a test is conducted there is a risk of type 1 error. For example, if the probability level of rejecting the null hypothesis is set at .05, then 5 out of 100 times the rejection of the null hypothesis will be in error. If multiple t tests are used, the rate of error increases exponentially by the number of tests conducted. To control for this type of error, the analysis of variance (ANOVA) which considers the variation across all groups is used. However, if post hoc analyses are required many techniques are available that will decrease the likelihood of making a Type 1 error when making multiple comparisons. Bonferroni approach is the most common method used to ensure a conservative estimate. The desired alpha is divided by the number of comparisons. For example, with an alpha of .05 and 5 comparisons, the significant level would have to be equal to or less than .01 for the comparison to be statistically significant.

5.4 **Summary**

The design of a research study is the basic outline of the study and the research question dictates the types of design. Thus, the design of the study determines whether the research question will be answered or not. A true experimental design has three criteria that must be met and they are: (1) the design must be able to test the hypotheses, (2) the extraneous variables have been controlled, and (3) the findings can be generalised to the population. The extraneous variables can be achieved by employing a randomisation technique or having a control group or both.

A longitudinal research design involves the application of repeated measurements of the same individuals on a number of occasions over a time frame that may be of days, weeks, months or years. The problem of multiple comparisons could be overcome by using ANOVA or for post hoc analyses Bonferroni approach. Longitudinal research design is a useful strategy especially for monitoring and obtaining measurements of changes of behaviour of either/both micro or macro magnitude. However, this design does have its problems which include subject attrition, subject conditioning, carry over effects, and can be a costly exercise in financial, personnel and infrastructure costs.

However great the methodological difficulties of a longitudinal design, it is an essential method if the researchers aims are to determine the influence of changing real-world or laboratory-based conditions, acting over a period of time, on the same individuals. Considerations of cost and the attrition of subjects and perhaps staff also, should lead us to make sure in advance that a longitudinal study is really necessary and feasible. Through longitudinal research, the researchers will get to know the characteristics of the subjects but the most important outcome is the determine the cause/effect relationship.

The next chapter presents the methodology selected for the present study.

Chapter 6 Methodology of the present study **Page**

Chapter 6

Methodology of the present study

6. Methodology

6.1 Background

The failure to give birth to an infant who is full term, the extended hospitalisation of the infant and the delay in being able to carry out normal caregiving activities are deemed to be sources of potent stress to the parents of premature infants (Pederson et al., 1987). An additional stressor for the parents of premature infants is the subsequent admission of the infant to special care nursery for observation, or, for sicker infants, the requirement for intensive care in a NICU.

Over the last 20 years, SCN in a tertiary centre (a teaching hospital affiliated with a university) has become more technically oriented, making it possible to provide care for smaller and sicker infants than before. At the same time SCN has the potential to increase the alienation of the parents from their infant. The parents may be frightened and overwhelmed by the sights and sounds of the SCN environment, with its plethora of monitoring equipment, health care professionals who tend to speak in unfamiliar jargon, the intense care and control provided, and the sight of other unusually small and sick infants.

The differences in the sample characteristics, timing of data collection and standardised instrument used to assess the parents reactions to preterm infants in NICU have made it difficult to compare studies. The studies in the 1960s and 1970s included infants who were very different from the infants in the 1980s because of the availability of advanced technology and increased in survival rate of ELBW and VLBW infants. Certainly, the NICU environment has changed dramatically because of the technological advances. The new policies of open visitation for parents and greater parental involvement in the care and decision-making make it difficult to compare studies. Most previous studies have collected data on maternal reactions to premature birth excluding the fathers and data were collected during the early hospitalisation period. It is in the last decade that the focus of research has shifted to the long-term follow-up of these preterm infants. The measures used to determine stress reactions vary from general questions to those standardised instruments that measure specific psychiatric disorders (e.g. depression) which may also contribute to variability in results. However, the important finding of the literature review was the identification that no study was found that focused on parents with preterm infants admitted to a special care nursery rather than a neonatal intensive care unit. Therefore this subgroup of preterm infants appeared to be an under studied area in neonatal nursing indicating the need for research in this area.

6.2 **Significance of the study**

The separation of mother and infant following premature birth can result in emotional and psychological deviations of the child to reach the expected milestones (Levy-Shiff et al., 1989). Premature delivery has been associated with an increased risk of child abuse (Hunter et al., 1978; Steele, 1987), and failure of the child to thrive (James and Mott, 1988), both of which are attributed to the emotional experiences and stress emanating from the mother's and infant's separation, giving rise to lack of sufficient nurturing and caregiving.

An important role for health care professionals in SCN is to be able to assess the responses and needs of these parents in order to assist them in understanding their new roles which will facilitate the development of normal parent-child relationships. The effects of parental stress should be able to be attenuated by the nurses working in the SCN who have the most contact with the parents. An important goal of this study is to identify the nature of these parents' experiences, which is typically overlooked in previous work. This finding will provide an evidence-base practice for nurses in the future.

To date, research studies on premature infants have tended to focus predominantly on the survival and the long-term outcomes of the extremely and the low birth weight infants in a neonatal intensive care unit (NICU) environment. With the increased survival of these premature infants the focus had shifted to the emotional needs of these parents in the NICU environment. There are premature infants who are admitted to SCN for observation because of their prematurity and also with the increased advanced technology tertiary SCN has the ability to provide care for smaller and sicker infants who would otherwise being cared for in NICU. However, no study has been carried out on the emotional and psychological needs of parents of these infants. Therefore there is a real need for research in this area. This proposed study would contribute to the limited information available on the experiences of parents with premature infants of 30-35 weeks gestational age being cared for in the tertiary SCN.

6.3 **Aims of the study**

The aims of this study are to: (a) determine the variables and levels of stress experiences amongst parents of premature infants born from 30-35 weeks gestational age who are admitted to the SCN; (b) identify the stressors perceived by these parents; (c) examine the coping strategies that parents use to deal with the stressful situation; (d) determine whether there is a correlation between self-reported stress and biochemical markers of stress; (e) determine whether perceived social supports buffer the impact of stress; and (f) identify the predictors of stress at Time 1 (within 24 hours after the parents' first visit to SCN) and Time 5 (16 weeks after the infant discharge home).

6.4 **Research questions**

(1) What are the levels of stress experiences of parents (both mothers and fathers) of premature infants from admission to special care nursery until 16 weeks following discharge home compared with parents (mothers and fathers) of term infants?

(2) What are the sources of the stressors perceived by these parents?

(3) Is there a relationship between self-reported stress and biochemical markers of stress?

(4) What are the coping strategies that parents of premature infants use to deal with the experience of premature birth?

(5) What are the predictors of stress in parents of preterm infants at Time 1 and Time 5?

(6) Does the availability of social supports buffer the impact of stress and mediate/moderate stressful responses?

6.5 **Research hypotheses**

1) Parents of premature infants in the SCN will report higher levels of stress (e.g. negative emotions of anxiety, anger, depression and stress and arousal (SACL) compared to parents of healthy term infants.

2) There are gender differences in the perception and experiences of stress between mothers and fathers of premature and term infants.

3) There is a positive relation between self-reported stress and levels of salivary cortisol and tribulin.

4) Parents will use both problem-and emotion solving coping strategies to deal with stress experiences.
5) The high scores of psychological and psychosocial variables, high levels of biochemical markers of stress, and the demographic profiles of infants and parents will predict the stress of parents.
6) The availability of high social supports will buffer the impact of stress on parents of preterm and term infants.

6.6 **Methods**

This study was carried out at the Mercy Hospital for Women, Melbourne, Australia, a large public teaching hospital affiliated with the University of Melbourne. The research utilised a controlled prospective longitudinal study design. On the days when the author was available for recruitment, all parents giving birth to a preterm infants aged 30-35 weeks gestational age were invited to participate during December 1997 to June 2000. The gestational age was recorded from the baby's history which was determined by the attending neonatologist. The parents of preterm infants were either approached in the postnatal ward or special care nursery within 24 hours after their first visit to SCN. Out of approximately 10,000 term births during the same period, parents of term infants were invited to participate in the study within 24 hours post delivery in the postnatal ward. The mothers of term infants were matched to mothers of preterm infants on maternal age within 5 years, parity according to primigravida and multigravida and on socioeconomic status such as occupation. The directors of the two divisions of neonatal services and obstetrics agreed to the study being carried out. Approvals to carry out the study were also obtained from the Human Research Ethics Committees of the hospital, RMIT, and Victoria University.

6.61 <u>Inclusion criteria for parents of preterm and term infants</u>

a) Both parents consenting to be involved

b) Primigravida and multigravida mothers and their partners

c) Parents aged between 20-40 years

d) Parents who were able to read and write English

e) Parents giving birth to a singleton

f) Parents with no known psychiatric history as recorded in the maternal history

g) Parents of infants with no congenital anomalies

h) Parents with no previous experience in a NICU/SCN

6.62 <u>Sample Size</u>

For the estimation of sample size for two groups, with α set at .05, power 80%, and 2 Tailed, the State-Anxiety Scale (Spielberger et al., 1970) and Stress/Arousal Checklist (SACL) (Gotts and Cox, 1988) were used. The State-Anxiety Inventory scores which were used to calculate the sample size was based on the study of maternal stress within the first postnatal week in NICU (Gennaro, 1988). With a mean of 37.6 and a standard deviation of 7.1 for mothers of preterm infants and mean of 31.8 with a standard deviation of 10.6 for mothers of term infants (control group), 50 in each group would give a power of 89% (Sample Power version 1.0). This computation assumes that the mean difference is 5.8 (corresponding to means of 37.6 versus 31.8) and the common within-group standard deviation is 9.0 (based on SD estimates of 7.1 and 10.6) . This effect was selected as the smallest effect that would be important to detect, in the sense that any smaller effect would not be of clinical or substantive significance. It is also assumed that this effect size is reasonable, in the sense that an effect of this magnitude could be anticipated in this field of research.

Using the Stress/Arousal Checklist (SACL), the sample size was calculated based on the original sample of Women's Clinic Patients (Gotts and Cox, 1988) with M 38, sd 13. Accepting that parents of term infants would experience the same degree of stress (M 38, sd 13) and allowing for a minimum of half a standard deviation increase for parents of preterm infants in SCN (M 45, sd 13), the sample size would be 50 in each group to yield a power of 85% (Sample Power 1.0 version). This computation assumes that the mean difference is -6.5 (corresponding to means of 38.0 versus 44.5) and the common within-group standard deviation is 13.0. This effect was selected as the smallest effect that would be important to detect, in the sense that any smaller effect would not be of clinical or substantive significance. It is also assumed that this effect size is reasonable, in the sense that an effect of this magnitude could be anticipated in this field of research.

Based on previous studies of first time parents and to allow for an estimate attrition of up to 20% (N=10), 60 couples were recruited to each group. A total of 120 mothers entered the study but only 119 fathers (1 father consented to the study but did not return the questionnaire). Results of the total number of 239 are reported in this study.

6.63 Psychological measures (Appendix A)

A battery of self-report scales was utilised that have been well validated in numerous studies. These instruments were used to collect information on the subjects' feelings, moods, marital/partner relationships, ways of coping and their perception of social support sources and value (satisfaction) (pp.117-136).

6.64 Objective measures

To estimate the biochemical markers of stress experiences, saliva samples were collected from each parent for (a) Cortisol – for evaluation of the hypothalamic-pituitary-adrenal function responses to stressful experiences (McCabe and Schneiderman, 1984); and (b) Tribulin - the endogenous monoamine oxidase inhibitor marker for anxiety and stress in humans (Doyle et al., 1996).

6.7 **Procedures**

Psychological measures and biochemical assays were collected from each mother and father in both the target and control groups.

For the parents of premature infants, measures were collected separately on the following occasions:

T1 - within 24 hours after the parent's first visit to SCN

T2 – a week after their infants was admitted to SCN

T3 – at the time of their infant discharge from the SCN

T4 - 1 week after discharge home

T5 – 16 weeks after discharge home

Times 1, 4 and 5 only were collected from the control group, as the mother and the healthy term infant are normally discharged home on day 2-5, therefore, the three measuring occasions were feasible and desirable and Times 2 and 3 were omitted.

6.71 <u>Method of data collection</u>

T1 - A semi-structured interview was conducted in the special care nursery/postnatal ward to elicit demographic information (Appendix A). Many parents after reading the questionnaire found that it was easy to answer and decided to complete them at their own pace and the questionnaires were then placed in a provided envelope; a range of psychological self-reports, Beck depression short form, environmental stressors of SCN, ways of coping checklist and social support questionnaire were completed by parents to establish baseline measurements; and salivary samples were collected at the same time between 4-8 pm.

T2 - Repeated measures included: assessment of environmental stressors of NICU, State Personality Inventory and Stress/Arousal Checklist, and salivary samples were collected at the same time. The questionnaire and the container with the cotton roll were placed in an envelope and left in the infant's cot together with an explanatory note for the parents. The parents were asked to place the sealed envelope in the infant's cot and collected by the investigator the next day.

T3 - Repeated measurements of State-Trait Personality Inventory, Stress/Arousal Checklist; and salivary samples were collected at the same time. The questionnaires and the containers with the cotton rolls were placed in an envelope and left in the infant's cot together with an explanatory note for the parents. The parents were asked to place the sealed envelope in the infant's cot and collected by the investigator the next day.

T4 - Repeated measures of State-Trait Inventory and Stress/Arousal Checklist, Beck Depression Scale, and salivary samples were collected at the same time. The questionnaires, and the containers with the cotton rolls were mailed to the parents together with an explanatory note. An addressed envelope was also included for the parents to return the questionnaires and the salivary samples.

T5 - Parental ways of coping, social support questionnaire and selected Psychological measures of State-Trait Inventory and Stress/ Arousal Checklist were repeated; and salivary samples were collected at the same time. The questionnaires, and the containers with the cotton rolls, were mailed to the parents together with an explanatory note. An addressed envelope was also included for the parents to return the questionnaires and the salivary samples.

Table 6.61 shows the times of the different measurements collected from the parents of preterm infants.

Table: 6.61 Timing of measures for parents of premature infants

Measures	T1	T2	T3	T4	T5
State Anxiety & Anger	✓	✓	✓	✓	✓
Trait Anxiety & Anger	✓				✓
Stress/Arousal	✓	✓	✓	✓	✓
PSS:NICU	✓	✓			
SDAS	✓				✓
WCCL	✓				✓
SSQ	✓				✓
BDI -SF	✓			✓	
Salivary Sample	pm	pm	pm	pm	pm

Table 6.62 shows the times of the different measurements collected from the parents of term infants.

Table 6.62: Timing of measures for parents of term infants

Measures	T1	T4	T5
State Anxiety & Anger	✓	✓	✓
Trait Anxiety & Anger	✓		✓
Stress/Arousal	✓	✓	✓
SDAS	✓		✓
WCCL	✓		✓
SSQ	✓		✓
BDI - SF	✓	✓	
Salivary Sample	pm	pm	pm

6.72 Sampling and storage of saliva specimens

Salivary samples were collected from each parent at predetermined days and times 4-8 pm. This time window was selected because it was reported (Toates, 1995) that normal cortisol levels are found to be high in the morning and low in the early evening and at night, showing a diurnal fluctuation. It was also hypothesised that this normal/usual pattern would be disturbed in subjects experiencing acute or prolonged stress. Each parent was given a small dental roll and instructed to rinse the mouth with plain water and then to place the roll in the mouth for the duration of the time it took to answer the self-report questionnaire (approximately 20 minutes). The parents were instructed to mail the salivary samples as soon as possible and studies had shown that they can be stored in the room temperature of 20^0C for two to four weeks without losing its cortisol levels (Kahn et al., 1988; Kirschbaum and Hellhammer, 1989). The saliva-soaked roll in a provided sampling container “Salivette” (Starstedt Inc., Rommelsdorf, Germany) was labelled with the subject’s details, the date and time of the sample collection and stored in a freezer of –80^oC in the University of Melbourne Laboratory at the Mercy Hospital for Women until ready for analysis. The specimens were then transported in a cool proof container (Esky) to the Psychoendocrine Laboratory at the Austin Repatriation Medical Centre for analyses. The analyses were carried out under the supervision of Professor T. Norman.

6.8 **Data analysis and management**

All data were coded and entered into a database using SPSS for Windows (Version 9.0, SPSS I, 2000) as the software to analyse the data. Due to the varied nature of the instruments used and the number of dependent variables, several statistical tests were employed in data analysis. Descriptive analyses were used to provide: (a) demographic profiles of each parent of premature/term infants; (b) demographic characteristics of the premature/term infants; (c) group scores on each of the self-report measures; and (d) group scores of cortisol and tribulin on each occasion of measurement according to each gender. Multivariate analysis of variance for repeated measures and independent t-test were used to determine if there was any difference between scores of parents of preterm and term infants and also to examine if there was any difference on key variables across the different assessment times. ‘Group’ was the between subject factor and ‘time’ was the within subject factor. The dependent variables were summed scores of self-report questionnaires and biochemical markers of stress and the independent variable was the group. Multiple regression analysis was used to identify the predictors of stress of the mothers and fathers of preterm and term infants at Time 1, and 5 controlling for stress scores at Time 1.

6.9 **Ethical consideration**

Participation in this study was voluntary. The study was verbally explained to the parents in plain English and a brief written explanatory sheet was given to the parents to read before obtaining a written consent (Appendix A). No individual's personal details were identified on the written materials, the data from each parent were coded with an identification number and the name was removed from the data. Permission for this study to be undertaken was obtained from the Human Research and Ethics Committees of RMIT, Victoria University and the Mercy Hospital for Women.

6.10 **Summary**

This was a controlled prospective longitudinal study. The target group was 60 parental couples of premature infants 30-35 weeks gestational age admitted to SCN and the control group was 60 parental couples of healthy term infants of 38-42 weeks gestational age.

The data were collected on five occasions from both parental partners of premature infants and on three occasions from both parental partners of term infants. The data consisted of subjective measures of self-report questionnaires on feelings, moods (anxiety, anger, depression); quality of marital/partner relationships; stress experiences; ways of coping; perception of availability and satisfaction with social support. Objective measures of biochemical markers of stress were collected from salivary samples on each of the measuring occasions, between 4-8 pm.

Chapter 7 **Results** **Page**

Chapter 7

Results

7. **Introduction**

The varied hypotheses to be tested required the application of several statistical tests and SPSS (Version 9.0) was used to analyse the data. Prior to analysis, the variables were examined through various SPSS programs to assess the accuracy of data entry, missing values, and the goodness of fit between their distributions and the assumptions of multivariate analysis. To deal with extreme skewness and kurtosis, the data were logarithmically transformed using Log10 if substantial positive skewness was the case and the use of square root if moderate positive skewness was apparent. Because the data were collected at five time periods from the parents of preterm infants and at three time periods from parents of term infants, analyses of variance for repeated measures were used for normal distribution. If the Mauchly test of sphericity was violated, the multivariate test of Wilks' lambda was reported. If only two time periods were analysed, Student's t-tests were applied. The values that were missing at random were dealt with by use of the Expectation-Maximisation (E-M) approach (see 7.1, p. 184).

7.1 **Missing data**

7.11 Expectation-Maximisation method

There are three types of missing data (Bennett, 2001): (1) missing completely at random (MCAR), where the subjects with complete data cannot be distinguished from subjects with incomplete data; (2) missing at random (MAR), the subjects with incomplete data differ from subjects with complete data; and (3) not missing at random (NMAR), the pattern of the missing data is non-random and can not be predicted from other variables in the data set.

Missing data is common in longitudinal designs and in this study the data were checked and two types were identified. One was where the subjects did not complete the entire questionnaire and the second occurred when the subjects did not return the questionnaire. These types can be accepted as missing at random, and the Expectation-Maximisation (E-M) approach was used (Bennett, 2001; Little and Rubin, 1987; Schafer, 1997). The E-M algorithm is an iterative procedure which consists of two steps in each iteration. In the Expectation-step (E-step) the distribution of the missing values is based on the known values for the observed data and the current estimate of the known parameter is found. In the Maximisation-step (M-step), the expected values, typically the means and covariances for the missing data obtained from the E-step, are substituted and then the likelihood function is maximised as if no data were missing and the new data are obtained. The new value estimates are substituted back into the E-step and a new M-step is performed until convergence is obtained which is when the value estimates from iteration to iteration become negligible. Thus the E-M algorithm handles missing data by: (1) replacing the missing values by the estimated values, (2) estimating the parameters, (3) reestimating the missing values assuming the new parameter estimates are correct, and (4) reestimating the parameters, and so forth, iterating until convergence is achieved.

7.2 **Comparison of parents of preterm and term infants**

7.21 Descriptive analyses

Descriptive analyses were carried out on all variables. In the mothers group, to reduce the extreme skewness and kurtosis, the state-anger scores at Times 1, 4, and 5 were logarithmically transformed using Log10 because they were substantially positively skewed. Cortisol and tribulin values at Times 1, 4, and 5 which were moderately positively skewed were logarithmically transformed using square root. In the fathers group, to reduce the extreme skewness and kurtosis, the state-anger and cortisol values at Times 1, 4, and 5 which were substantially positively skewed were logarithmically transformed using Log10.

The sample consisted of two groups of parents, 119 parents (60 mothers and 59 fathers) of infants born from 30-35 weeks gestation and 120 parents (60 mothers and 60 fathers) of infants born at full term, i.e. between 38-42 weeks gestation. One father of a preterm infant consented to be involved in the study but did not return the questionnaires. Two sets of parents of preterm infants were withdrawn from the study after they had completed the questionnaires at Time 1 because both infants were transferred to the neonatal intensive care nursery (NICU). One of these infants developed respiratory distress and required respiratory support and the other infant developed non-perforated necrotising enterocolitis and required respiratory support. However, the parents' answers were included in the Time 1 analysis.

Further losses of participants occurred over time.

Parents of preterm infants: At Time 2, 6 (10%) mothers and 13 (22%) fathers; at Time 3, 25 (42%) mothers and 27 (45%) fathers; at Time 4, several parents returned leaving 12 (20%) mothers and 13 (22%) fathers whose reports were still missing; at Time 5, 17 (28%) mothers and 17 (29%) fathers did not provide reports.

Parents of term infants: At Time 4, 2 (3%) mothers and 2 (3%) fathers failed to return their reports; at Time 5, the reports of 5 (8%) mothers and 8 (13%) fathers were still missing.

Some of the parents collected their salivary specimens in the morning and not during the time as instructed which was between the hours of 4-

8 pm. These data were not included in the analyses of cortisol and tribulin because the circadian rhythms show both values to be naturally highest in the morning.

Because losses of participants occurred over time the total number of subjects varied at different time periods. Table 7.1 shows the number of subjects who returned the salivary samples which were correctly collected as instructed. The percentages indicated the proportions of received samples at each time frame. The different denominators indicate the variable reductions in total samples obtained over time.

Table 7.1: Number of subjects who returned the salivary samples and collected as instructed

Time	Preterm		Term	
	Mothers N (%)	Fathers N (%)	Mothers N (%)	Fathers N (%)
1	46/60 (77)	46/59 (78)	45/60 (75)	42/60 (70)
2	45/54 (83)	41/46 (89)	N/A	N/A
3	31/35 (89)	30/32 (91)	N/A	N/A
4	40/48 (83)	37/46 (80)	46/58 (79)	47/58 (81)
5	42/43 (98)	39/42 (93)	45/55 (82)	42/52 (81)

There were some parents in both groups who agreed to participate in the study but failed to return the questionnaires and some who did not wish to participate in the study.

Parents of preterm infants: Six couples who originally agreed to participate in the study did not return the questionnaires. Eleven couples did not consent to the study. Out of that group, three couples commented that they had too many things on their mind and were too busy to join the study; two mothers said they were not well enough to join the study, two mothers and one father from different families said the questionnaires were too personal; and one mother and two fathers from different families did not give any reason for their refusal.

Parents of term infants: Eight couples agreed to participate in the study but did not return the questionnaires. Out of that group two of the babies became unwell, one mother was discharged early from the hospital and the remaining five did not give any reasons. Eight couples did not agree to join the study. Out of that group, four couples commented that they were too busy to join the study, two mothers said the questionnaires were too personal, and two fathers refused but gave no reasons.

Demographic profiles of all the parents recruited to the study are shown in Table 7.2, p. 189.

Table 7.2: Demographic profiles of the parents (Time 1)

	Preterm Mothers N=60	Term Mothers N=60	Preterm Fathers N=59	Term Fathers N=60
Age(yrs): M (sd)	30 (5)	30 (4)	33 (6)	32 (5)
Ethnicity: N (%)				
Australia	36 (60)	38 (63)	37 (63)	42 (70)
British	6 (10)	3 (5)	4 (7)	0 (0)
European	8 (13)	10 (17)	7 (12)	10 (17)
Asian	3 (5)	3 (5)	4 (7)	4 (7)
Other				
Education: N (%)				
Primary	1 (2)	0 (0)	0 (0)	0 (0)
Secondary	25 (42)	16 (27)	18 (30)	11 (18)
Trade/Apprenticeship	0 (0)	6 (10)	9 (15)	17 (28)
Certificate/Diploma	10 (17)	8 (13)	10 (17)	10 (17)
Bachelor Degree/Higher	24 (40)	30 (50)	21 (36)	22 (37)
Missing	0 (0)	0 (0)	1 (2)	0 (0)
Occupation: N (%)				
Professional	25 (42)	30 (50)	31 (53)	34 (57)
Tradesperson/Related Workers	5 (8)	9 (15)	18 (31)	23 (38)
Clerical/Related Workers	16 (27)	15 (25)	2 (3)	2 (3)
Labourers	4 (7)	0 (0)	1 (2)	0 (0)
Home duties	10 (17)	5 (8)	0 (0)	0 (0)
Other	0 (0)	1 (2)	7 (12)	1 (2)
Parity: N (%)				
Primiparous	44 (73)	46 (77)		
Multiparous	16 (27)	14 (23)		
Mode of delivery: N (%)				
Vaginal	52 (87)	55 (92)		
Caesarean section	8 (13)	5 (8)		

Preterm group: The average maternal age was 30 years (range 21-40 years), 57% had undergone college and higher education and 42% were in professional occupations. The average paternal age was 33 years (range 22-55 years), 53% had received college and higher education and 53% were in professional occupations. Eighty two percent of the parents were caucasian and of the remainder (18%) were of Asian background with one couple of Aboriginal origin. In this group, 87% babies were born by vaginal delivery and 13% by elective caesarean section. Seventy three percent of mothers were having their first baby (primigravida) and 27% were having subsequent babies (multigravida).

Term group: In the term group, the average maternal age was 30 years (range 23-40 years), 63% had received college and higher education and 50% were in professional occupations. The average paternal age was 32 years (range 22-43 years), 54% had undergone college and higher education and 57% were in professional occupation. Eighty five percent of the parents were caucasian and of the remainder (15%) was of Asian background. In this group, 92% babies were born by vaginal delivery and 8% by elective caesarean section. There were 77% primigravida and 23% multigravida.

There were no significant differences in the demographic profiles of the mothers in both groups in terms of age ($p < .729$), education level ($p < .161$), occupation ($p < .111$), parity ($p < .676$) and mode of delivery ($p < .382$).

In the fathers, there were no significant differences in age ($p < .097$), and educational level ($p < .489$), but a significant difference in occupation ($p < .021$) indicating more fathers in the term group were in professional and trades occupations.

The characteristics of the preterm and term infants are shown in Table 7.3, p. 191.

Table 7.3: Demographic characteristics of the infants

	Preterm		Term	
		M (sd)		
	N=60		N=60	p
Gestation (wk)	33 (1)		40 (1)	<.001
Birth weight (gm)	2066 (397)		3444 (391)	<.001
Hospitalisation (day)	26 (10)		4 (1)	<.001
		N (%)		
Sex : Male	32 (53)		31 (52)	NS
Female	28 (47)		29 (48)	NS

The mean gestational age of the preterm babies was 33 weeks (range 30-35 weeks) and the mean birth weight was 2066g (range 1064-3128g). The mean gestational age of the term babies was 40 weeks (range 38-41 weeks) and the mean birth weight was 3444g (range 2475-4260g). As expected, there were significant differences between the infant groups in gestational age ($p < .001$), birth weight ($p < .001$), and number of days of hospitalisation ($p < .001$) with the premature infants more underage and under-developed or lower birth weight and remaining in hospital for longer.

Hypothesis 1: Parents of premature infants will report higher stress than parents of term infants.

Hypothesis 2: There are gender differences in the perception and experiences of stress between mothers and fathers of premature and term infants.

The above hypotheses were tested using univariate, MANOVA and ANOVA for repeated measures analyses (pp.192-211).

The norms of the variables are shown in Table 7.4

Table 7.4 Norms of the variables

Variables	M (sd)		Norms	
State-Trait Personality Inventory:				
	23-32 years		33 years or older	
	F	M	F	M
State-anxiety	18.6 (6.8)	18.7 (5.5)	18.2 (5.8)	16.9 (5.6)
State-anger	13.7 (5.7)	14.3 (6.0)	13.7 (5.2)	13.3 (4.9)
Trait-anxiety	18.0 (5.0)	18.1 (4.8)	18.0 (5.5)	16.3 (4.7)
Trait-anger	18.5 (4.5)	18.5 (5.0)	18.1 (4.8)	17.4 (5.2)
Stress/Arousal Checklist:				
Stress		38.2 (12.8)		
Arousal		31.9 (8.3)		
Beck Depression Inventory, Short Form:				
Beck depression inventory		4.73 (4.73)		
Biochemical markers of stress:				
		PM M ± SEM (range)		
Cortisol		3.9 ± 0.2 nmol/L (2.2 – 4.2 nmol/L)		
Tribulin		an inhibition of 25% to a peak of just over 50% immediately following a stressor		

The univariate analysis was used so that each variable could be examined separately. Table 7.5, p. 194 shows the results of the self-reports of anxiety, anger, arousal, stress; cortisol and tribulin (biochemical markers of stress); maternal depression; marital/partner relationship; and social support measures at each time period for parents of preterm and term infants. In the mothers, at Time 1, there were significant differences between the groups in state-anxiety ($p < .001$), state-anger ($p < .008$), self-reported stress ($p < .001$), indicating that the mothers of preterm infants were the more stressed and distressed. The group differences in trait-anxiety were significant ($p < .027$) indicating that mothers of preterm infants were more prone to anxiety compared to mothers of term infants.

At Time 1, between the fathers, there were significant group differences in state-anxiety ($p < .001$), self-reported stress ($p < .003$), arousal ($p < .008$), relationship quality (DAS) ($p < .003$), and satisfaction with perceived support ($p < .041$). The result showed that the fathers of preterm infants reported more stress, inversely related to arousal levels, while their relationship and perceived/received social support was also less positive.

At Time 1, fathers of term infants reported a better relationship quality (DAS) with their partners and also were more satisfied with perceived support than fathers of preterm infants.

Table 7.5: Univariate analysis of profiles of measures for parents of preterm and term infants

		Mothers				Fathers			
			Preterm		Term m (sd)		Preterm		Term
Variables	Time	N		N		N		N	
State Anxiety	1	60	21.4 (6.7)**	60	16.8 (4.7)	59	20.1 (5.9)**	60	16.4 (4.6)
	4	60	17.4 (4.9)	60	16.8 (4.9)	59	16.7 (5.1)	60	17.0 (5.0)
	5	60	14.5 (4.6)	60	16.3 (4.9)	59	16.2 (4.4)	60	16.5 (4.5)
State Anger	1	60	1.1 (9.2E-02)**	60	1.0 (5.7E-02)	59	1.1 (0.1)	60	1.1 (8.2E-02)
(transformed	4	60	1.1 (7.7E-02)	60	1.0 (8.1E-02)	59	1.1 (9.7E-02)	60	1.1 (8.0E-02)
Log10)	5	60	1.0 (9.3E-02)	60	1.1 (7.8-E-02)	59	1.1 (0.1)	60	1.1 (9.9E-02)
Stress	1	60	40.2 (12.3)**	60	31.5 (8.6)	59	36.2 (10.7)**	60	30.6 (9.1)
	4	60	33.8 (9.0)	60	31.3 (9.1)	59	31.4 (10.6)	60	30.0 (8.1)
	5	60	29.7 (10.0)	60	29.9 (10.7)	59	30.6 (9.0)	60	31.5 (9.4)
Arousal	1	60	33.8 (9.0)	60	31.3 (9.1)	59	30.8 (6.6)**	60	34.0 (6.5)
	4	60	28.7 (6.5)	60	29.7 (6.7)	59	32.6 (5.8)	60	34.0 (6.0)
	5	60	32.5 (6.1)	60	31.8 (6.8)	59	34.8 (6.5)	60	32.5 (6.8)
Cortisol	1	47	2.2 (0.9)	47	2.5 (1.2)	48	4.8 (3.8)	48	5.2 (4.4)
(transformed	4	46	2.3 (1.2)	46	2.3 (1.1)	47	5.0 (6.0)	47	5.0 (5.4)
square root)	5	47	1.9 (0.8)	46	1.9 (0.8)	45	3.8 (3.4)	46	5.4 (6.5)
Tribulin	1	47	2.6 (1.1)	47	2.8 (1.4)	48	8.5 (5.9)	48	8.7 (7.4)
(transformed	4	46	3.0 (1.4)	46	3.1 (1.3)	47	9.2 (6.9)	47	9.2 (5.5)
square root)	5	47	3.1 (1.1)	46	2.8 (1.3)	45	10.2 (6.3)	46	10.5 (6.3)
Trait-anxiety	1	60	18.3 (4.8)*	60	16.6 (3.3)	59	17.1 (5.1)	60	16.7 (4.2)
	5	60	17.4 (4.6)	60	16.8 (4.6)	59	16.4 (4.2)	60	17.0 (4.5)
Trait-anger	1	60	18.3 (4.1)	60	17.1 (3.3)	59	17.1 (4.1)	60	17.6 (3.6)
	5	60	17.5 (3.8)	60	17.4 (3.7)	59	16.7 (3.5)	60	17.1 (4.4)
Relationship	1	60	5.8 (1.3)	60	6.2 (0.9)	59	5.6 (1.2)**	60	6.1 (0.7)
quality	5	60	5.2 (1.2)	60	5.2 (1.3)	59	5.2 (1.5)	60	5.5 (1.1)
Depression	1	23	2.6 (1.3)	23	1.9 (1.3)				
	4	23	3.0 (0.7)	23	2.8 (1.3)				
Social support:									
Number	1	60	21.0 (11.2)	60	23.8 (12.9)	59	18.6 (13.7)	60	20.0 (10.9)
	5	60	20.5 (9.8)	60	21.2 (11.0)	59	16.4 (11.3)	60	14.9 (9.4)
Satisfaction	1	60	33.6 (4.5)	60	34.3 (2.3)	59	31.4 (7.4)*	60	33.5 (2.6)
	5	60	32.6 (4.0)	60	32.7 (4.6)	59	31.6 (4.2)	60	32.1 (2.7)

**p < 0.01 *p < 0.05

Table 7.6 shows the univariate results of the cortisol and tribulin. Only samples collected as instructed are reported. In reporting the salivary samples the standard error of the mean was used instead of the standard deviation in keeping with convention in the biochemical literature (Glover and Sandler, 1990; Laudat et al., 1988;).

Table 7.6: Cortisol and tribulin levels of parents of preterm and term infants

		Mothers				Fathers			
		Preterm		Term		Preterm		Term	
	Time	N	M (± SEM)	N	M (± SEM)	N	M (± SEM)	N	M (± SEM)
Cortisol	1	46	4.5 (0.5)	48	8.6 (1.2)	48	4.8 (0.6)	48	5.2 (0.6)
(nmol/L)	4	40	5.6 (1.0)	52	7.1 (1.0)	47	5.1 (0.9)	47	5.0 (0.8)
	5	42	4.3 (0.5)	51	3.9 (0.5)	45	3.8 (0.6)	46	5.4 (1.0)
Tribulin	1	46	7.9 (0.8)	48	10.0 (1.1)	48	8.5 (0.9)	48	8.7 (1.1)
(%)	4	40	11.2 (1.2)	52	10.8 (1.1)	47	9.2 (1.0)	47	9.2 (0.8)
	5	42	10.8 (1.1)	51	9.7 (0.7)	45	10.3 (0.9)	46	10.5 (0.9)

Cortisol: Mothers of preterm infants had lower mean cortisol values at Times 1 and 4 than mothers of term infants but there was little difference between the two groups at Time 5. Within each group, at Time 5, mothers of preterm infants had a lower value followed by Times 1 and 4. However, the value increased by 24% from Time 1 to Time 4 and decreased to near baseline at Time 5. For the mothers of term infants, the highest value was at Time 1, followed by Times 4 and 5. At Time 5, the value had decreased by 55% from Time 1 to baseline value. Compared to the norms (Orth et al., 1992; Laudat, 1988), mothers of preterm infants had higher cortisol levels only at Time 4 which did not match with their self-reports. However mothers of term infants had twice the levels at Time 1, and one and a half at Time 4 indicating that they were more stressed than mothers of preterm infants.

Fathers of preterm infants had slightly lower values of cortisol than fathers of term infants at Time 1 but there were no differences at Time 4. However, at Time 5, fathers of preterm infants had higher values than fathers of term infants. Within each group, the cortisol values of the fathers of preterm infants returned to baseline value at Time 5, but the cortisol values of the fathers of term infants were slightly increased at Time 5. Compared to the norms (Orth et al., 1992; Laudat, 1988), fathers of preterm infants had slightly higher levels at Time 4 and fathers of term infants had slightly higher levels at all three time periods which did not match by their self-reports.

Tribulin: Mothers of preterm infants had lower tribulin levels at Time 1, and the highest at Time 4. Within each group, mothers of preterm infants had an increase of 42% at Time 4 from Time 1 but levels decreased by 36% at Time 5. There were no statistically significant differences for the mothers of term infants at each of the three time periods. Compared to the norms (Hucklebridge et al., 1998), the tribulin levels of the mothers in both gestational groups were lower.

Fathers of preterm infants had lower tribulin levels at Time 1 than fathers of term infants but there were no differences between the two groups at Times 4 and 5. Within each group, fathers of preterm infants levels increased with time, with a 21% increase at Time 5 from Time 1. For the fathers of term infants, the tribulin levels also increased with time, with a 21% increase from Time 1 to Time 5. Compared to the norms (Hucklebridge et al., 1998), fathers of both gestational groups also returned lower tribulin levels.

The relationship quality of the parents was analysed next. Because there were two independent groups, student's t-tests were used to analyse the scores between the gestational groups and also between the mothers and fathers of each gestational group.

The quality of marital/partner relationships in the parents of preterm and term infants were measured using the one global item of the Dyadic Adjustment Scale (DAS). Table 7.7 shows the scores between the parents of preterm and term infants (including missing values) and Table 7.8, p. 198 shows the scores within the mothers and fathers of the two groups.

Table 7.7: Comparing DAS scores between parents of preterm and term infants

	N	Preterm Mothers	N	Term Mothers	M (sd) p	N	Preterm Fathers	N	Term Fathers	p
Time 1	60	5.8 (1.3)	60	6.2 (0.9)	.062	59	5.6 (1.2)	60	6.1 (0.7)	.003
Time 5	60	5.2 (1.2)	60	5.2 (1.3)	.919	59	5.2 (1.5)	60	5.5 (1.1)	.166

** $p < 0.01$ * $p < 0.05$

Using independent t-tests, comparisons of perceived marital/partner relationship quality showed that mothers of term infants reported more satisfaction with their relationship than did mothers of preterm infants at Time 1 but differences were not statistically significant. However by Time 5, the reported relationship quality in the mothers of term infants had deteriorated to approximate that of the mothers of preterm infants. For mothers of preterm infants there were no within group differences between Time 1 and Time 5 periods. Comparison of the men's perceived marital/partner relationship quality also showed that fathers of term infants reported a more satisfactory relationship with their partners than did fathers of preterm infants at Time 1 and the difference was significant ($p < .003$). However at Time 5 the relationship quality of fathers of term infants had also deteriorated. For fathers of preterm infants there were no reported differences across these two periods.

Table 7.8: Comparing DAS scores within parents of preterm and term infants

			M (sd)		
	N	Time 1	N	Time 5	p
Preterm parents:					
Mothers	60	5.8 (1.3)	60	5.2 (1.2)	.001
Fathers	59	5.6 (1.2)	59	5.2 (1.5)	.021
Term parents:					
Mothers	60	6.2 (0.9)	60	5.2 (1.3)	<.001
Fathers	60	6.1 (0.7)	50	5.5 (1.1)	<.001

** $p < 0.01$ * $p < 0.05$

Using paired sample t tests, comparisons of the relationship quality of mothers of preterm infants at Time 1 and Time 5 showed a more satisfactory relationship with their partner at Time 1 than at Time 5 and these within-group differences were statistically significant ($p < .001$) even though the mean differences were only minimal. Fathers of preterm infants also reported a more satisfactory relationship with their partner at Time 1 than at Time 5 and the change was significant ($p < .021$). Mothers of term infants also reported more satisfactory relationships with their partner at Time 1 than at Time 5 and these differences were highly statistically significant ($p < .001$). By Time 5, the relationship quality for these mothers had deteriorated. Fathers of term infants also reported a better relationship at Time 1 than at Time 5 and these differences were also statistically significant ($p < .001$). The fathers' perceived relationship quality had also deteriorated by Time 5.

Multivariate analysis of variance (MANOVA) was used to compare the groups on whether a combination of the self-report and objective measures varied as a function of gestation for both parents of preterm and term infants. The next section shows the results of the MANOVA.

7.22 Multivariate analysis of variance (MANOVA)

Table 7.9a, p.201 shows the cross-sectional results of MANOVA comparing the mothers of preterm and term infants. At Time 1 there were statistically significant differences between the mothers of preterm and term infants in anxiety ($p < .001$), anger ($p < .010$), self-reported stress ($p < .001$), trait-anxiety ($p < .021$), and relationship quality ($p < .047$), indicating that mothers of preterm infants were more stressed with more negative moods and at the same time they reported a less satisfactory relationship with their partners at Time 1.

For the two groups of mothers, MANOVA was used to analyse longitudinal data of stress at Time 4 controlling for stress levels at Time 1. The results showed a significant difference only in self-reported stress ($p < .009$). The same procedure was performed at Time 5 controlling for stress at Time 1 that showed a significant difference in trait-anxiety ($p < .007$) between both groups.

Table 7.9a: Mothers of preterm and term infants:
MANOVA comparing combined measures of self-reports and biochemical markers of stress as a function of gestation type (N = 94, 92; 93)

	Preterm		Term		
	N	m (sd)	N	m (sd)	p
Time 1	47		47		
State-anxiety		21.1 (6.5)**		16.5 (4.1)	<.001
State-anger (Log10 transformed)		1.1 (9.4E-02)**		1.0 (5.7E-02)	.010
Stress		39.9 (12.1)**		31.2 (7.5)	<.001
Arousal		33.9 (8.7)		30.5 (8.5)	.063
Trait-anxiety		18.3 (4.8)*		16.4 (3.1)	.021
Trait-anger		18.4 (4.4)		17.2 (3.1)	.131
Cortisol (Square root transformed)		2.2 (0.9)		2.5 (1.2)	.326
Tribulin (Square root transformed)		2.6 (1.1)		2.8 (1.4)	.522
Relationship quality		6.0 (1.2)*		6.0 (1.1)	.047
Social support					
Number		20.3 (11.3)		22.7 (12.0)	.322
Satisfaction		33.6 (3.6)		34.2 (2.1)	.347
Time 4	46		46		
State-anxiety		17.0 (4.6)		16.5 (4.8)	.578
State-anger (Log10 transformed)		1.1 (6.7E-02)		1.1 (7.0E-02)	.199
Stress		34.1 (8.8)		30.7 (8.6)	.065
Arousal		29.0 (7.0)		29.7 (5.8)	.591
Cortisol (Square root transformed)		2.0 (1.2)		2.3 (1.1)	.902
Tribulin (Square root transformed)		3.0 (1.4)		3.1 (1.3)	.647
Time 5	47		46		
State-anxiety		14.3 (4.1)		15.5 (4.5)	.184
State-anger (Log10 transformed)		1.0 (5.7E-02)		1.0 (6.6E-02)	.269
Stress		29.3 (8.7)		29.8 (9.9)	.795
Arousal		32.3 (6.7)		31.8 (6.1)	.748
Trait-anxiety		17.5 (4.4)		16.7 (4.5)	.414
Trait-anger		17.6 (4.0)		17.2 (3.7)	.655
Cortisol (Square root transformed)		1.9 (0.8)		1.9 (0.8)	.951
Tribulin (square root transformed)		3.1 (1.1)		2.9 (1.4)	.284
Relationship quality		5.3 (1.1)		5.3 (1.1)	.907
Social support:					
Number		20.6 (10.0)		20.8 (10.3)	.938
Satisfaction		32.9 (3.6)		32.4 (5.1)	.520

**p < 0.01 *p < 0.05

Findings of the fathers' reports cross-sectional data using MANOVA at Time 1 (Table 7.9b, p.203), revealed significant differences between the two groups of fathers in anxiety ($p < .013$), self-reported stress ($p < .050$), arousal ($p < .018$), and quality of relationship ($p < .004$). These results indicated that fathers of preterm infants had more negative moods and the fathers of term infants reported a more satisfactory relationship. There was also a significant difference in relationship quality ($p < .030$) at Time 5 for the fathers of term infants indicating a more satisfactory relationship with their partners compared to fathers of preterm infants.

For the two groups of fathers, MANOVA was used to analyse longitudinal data of stress at Time 4 controlling for stress levels at Time 1, showed significant differences in anxiety ($p < .001$), anger ($p < .005$), stress ($p < .001$), and arousal ($p < .002$), indicating that fathers of preterm infants were more stressed and angry. Interestingly, fathers of term infants were more anxious and had higher arousal levels. The same procedure was performed at Time 5 and again there were significant differences in anxiety ($p < .017$), stress ($p < .008$), and arousal ($p < .001$), trait-anxiety ($p < .001$), relationship quality ($p < .002$), and satisfaction with perceived support ($p < .023$). The results indicated that fathers of term infants had more negative feelings, but were less aroused.

Table 7.9b: Fathers of preterm and term infants:
MANOVA comparing combined measures of self-reports and biochemical markers of stress as a function of gestation type (N = 96; 94; 91)

	Preterm		Term		
	N	m (sd)	N	m (sd)	p
Time 1	48		48		
State-anxiety		19.3 (4.9)*		16.8 (4.8)	.013
State-anger (Log10 transformed)		1.1 (9.5E-02)		1.1 (8.9E-02)	.484
Stress		34.7 (9.4)*		31.0 (9.3)	.050
Arousal		31.2 (6.4)*		34.3 (6.2)	.018
Trait-anxiety		17.7 (5.3)		16.7 (4.4)	.326
Trait-anger		16.9 (4.1)		17.3 (3.3)	.570
Cortisol		4.8 (3.8)		5.2 (4.4)	.624
Tribulin		8.5 (5.9)		8.7 (7.4)	.896
Relationship quality		5.6 (1.2)*		6.2 (0.6)	.004
Social support:					
Number		19.1 (14.2)		19.7 (10.8)	.822
Satisfaction		31.3 (7.8)		33.5 (2.7)	.069
Time 4	47		47		
State-anxiety		16.3 (4.7)		17.1 (5.1)	.473
State-anger (Log 10 transformed)		1.1 (8.2E-02)		1.1 (8.0E-02)	.808
Stress		30.9 (9.6)		30.2 (8.1)	.686
Arousal		32.9 (5.9)		34.3 (5.9)	.239
Cortisol		5.0 (6.0)		5.0 (5.4)	.969
Tribulin		9.2 (7.0)		9.2 (5.5)	.994
Time 5	45		46		
State-anxiety		16.4 (4.3)		16.6 (4.1)	.799
State-anger (Log 10 transformed)		1.1 (9.9E-02)		1.1 (8.8E-02)	.688
Stress		30.2 (8.7)		31.7 (9.0)	.401
Arousal		34.8 (6.7)		33.2 (6.4)	.254
Trait-anxiety		16.1 (4.2)		16.9 (4.7)	.429
Trait-anger		16.4 (3.4)		16.5 (3.8)	.955
Cortisol		3.8 (3.4)		5.4 (6.5)	.145
Tribulin		10.3 (6.3)		10.5 (6.3)	.848
Relationship quality		5.2 (1.4)*		5.8 (0.9)	.030
Social support:					
Number		15.6 (11.1)		15.3 (9.9)	.871
Satisfaction		31.6 (4.4)		32.4 (2.7)	.330

$^{**}p < 0.01$ $^{*}p < 0.05$

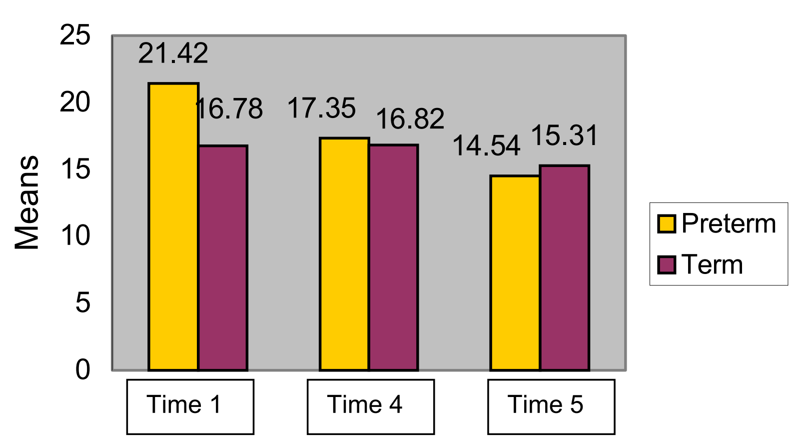
The next section shows the results of the analyses of variance for repeated measures which were used to compare the stress levels of parents of preterm and term infants because the data were collected at more than one time period. The within-subjects factor TIME had three levels: Time 1 within 24 hours after the parents first visit to SCN (for parents of preterm infants), within 24 hours after the birth of the infant (for parents of term infants); Time 4 (1 week after the infant had been discharged home); and Time 5 (16 weeks after the infant had been discharged home). The between-subjects factor GESTATION had two levels, parents of preterm and term infants.

7.23 <u>ANOVA for repeated measures and Independent t-tests</u>

ANOVA for repeated measures and Independent-t tests were used to analyse measures of: state-anxiety, trait-anxiety and trait-anger, self-reported stress and arousal for parents of preterm and term infants (see pp. 205-211).

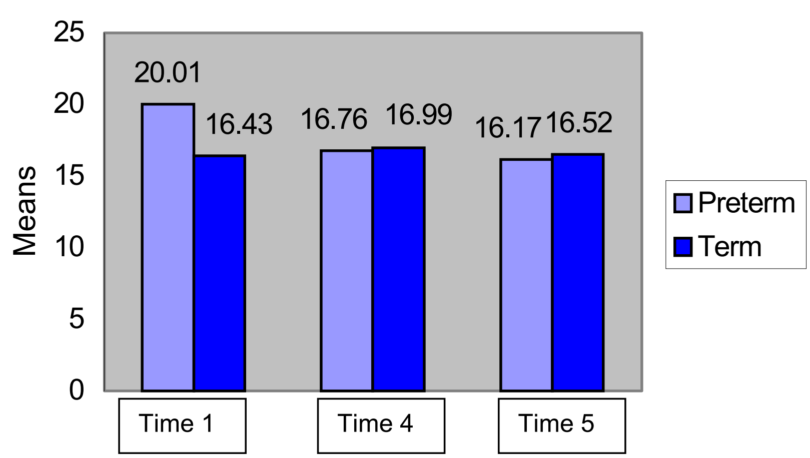
The results (see Figure 7.1a) showed that there was a significant difference over time in state-anxiety between mothers of preterm and term infants, $F(1, 118) = 3.947$, $p < .049$, at Time 1 ($p < .001$). Further there was a significant interaction between time and gestation group, Wilks'$\Lambda = .834$, $F(2, 117) = 11.620$, $p < .001$ indicating that mothers of preterm infants were significantly more anxious at Time 1, with a gradual reduction by Time 4 and Time 5. However, the mothers of term infants showed similar levels of anxiety at Time 1 and 4 and were less anxious at Time 5. Their group mean at the final measuring occasion (Time 5) was higher than in the mothers of the preterm group, even though the differences were not significant.

Figure 7.1a: State-anxiety levels of mothers of preterm and term infants (N=120)



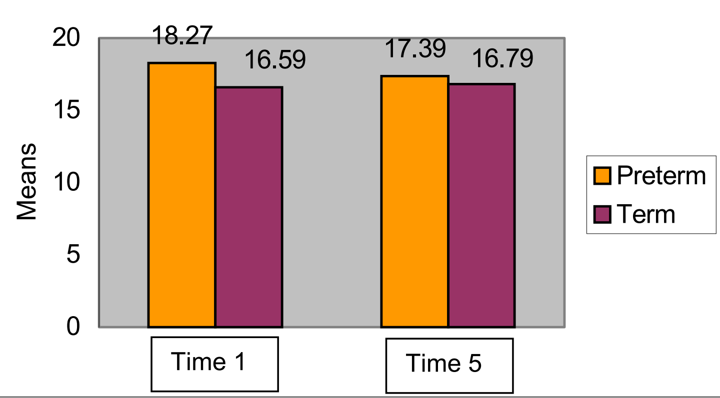
In the fathers, there were no significant differences over time between the two groups, F (1, 118) = 1.955, $p < .165$ although there was a significant interaction between time and gestation group, F (2, 236) = 11.287, $p < .001$ indicating the fathers of preterm infants were more anxious at Time 1 only. However, in the fathers of term infants there were minimal differences in their anxiety levels at each of the three time periods (see Figure 7.1b).

Figure 7.1b: State-anxiety levels of fathers of preterm and term infants (N-119)



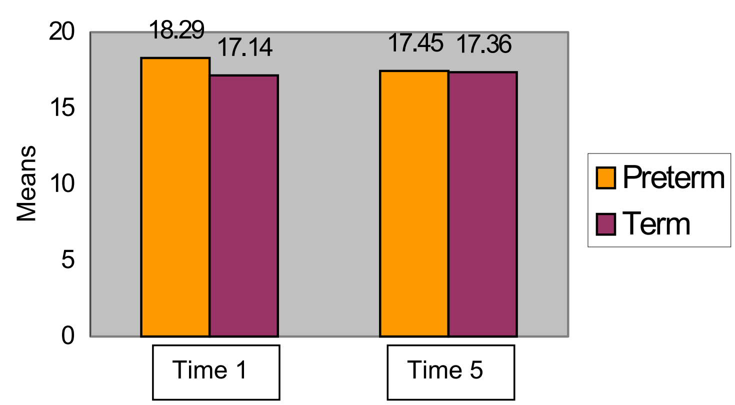
Independent t-tests were carried out on the mothers' trait-anxiety scores to examine any differences. Results showed a significant group difference in trait-anxiety level at Time 1 ($p < .028$), but not at Time 5 ($p < .475$) (see Figure 7.2a).

Figure 7.2a: Trait-anxiety levels of mothers of preterm and term infants (N=120)

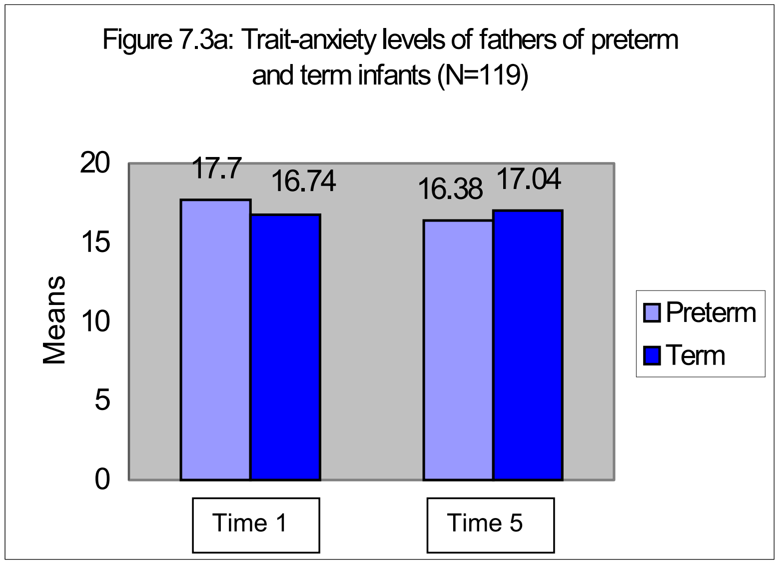


Results of independent t-tests for the mothers' trait-anger scores showed no significant group differences at Time 1 ($p < .095$) or Time 5 ($p < .893$) (see Figure 7.2b). Even thought the preterm group at Time 1 returned higher mean than the mothers of term infants, none of these values exceeded the norms of the measures (Spielberger, 1970).

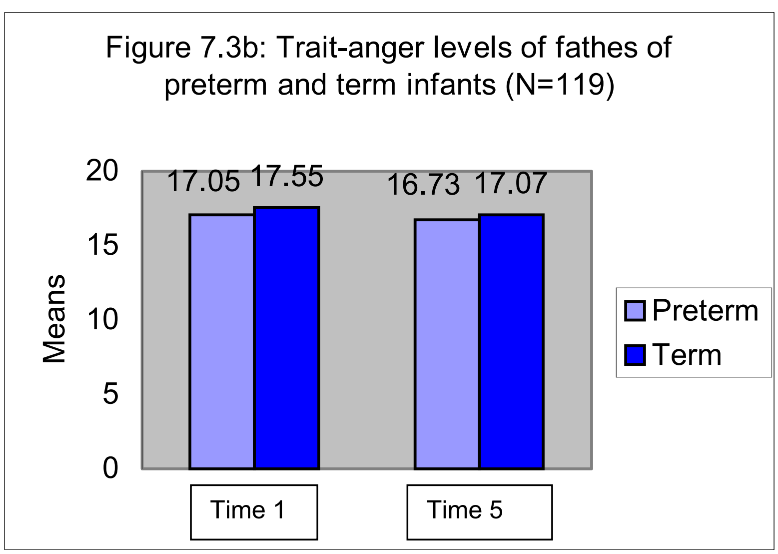
Figure 7.2b: Trait-anger levels of mothers of preterm and term infants (N=120)



Results of independent t-tests between the two groups of fathers showed no significant differences in their trait-anxiety levels at Time 1, $p < .264$, nor at Time 5, $p < .415$ (see Figure 7.3a).

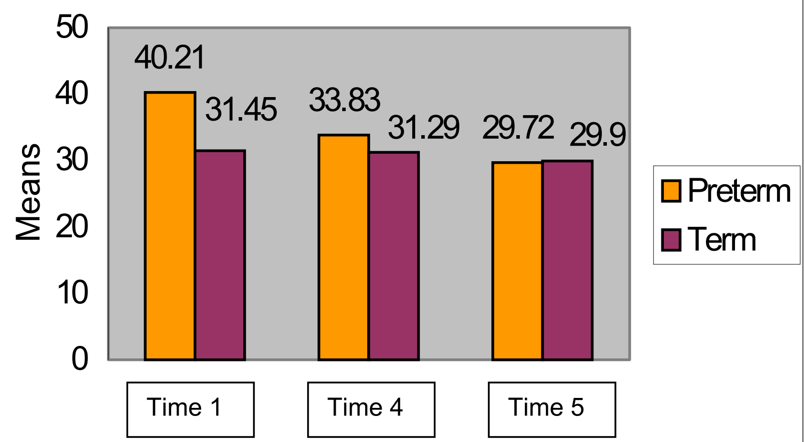


No significant differences were found between the two groups in their trait-anger levels at Time 1, $p < .475$, and Time 5, $p < .639$ (see Figure 7.3b).



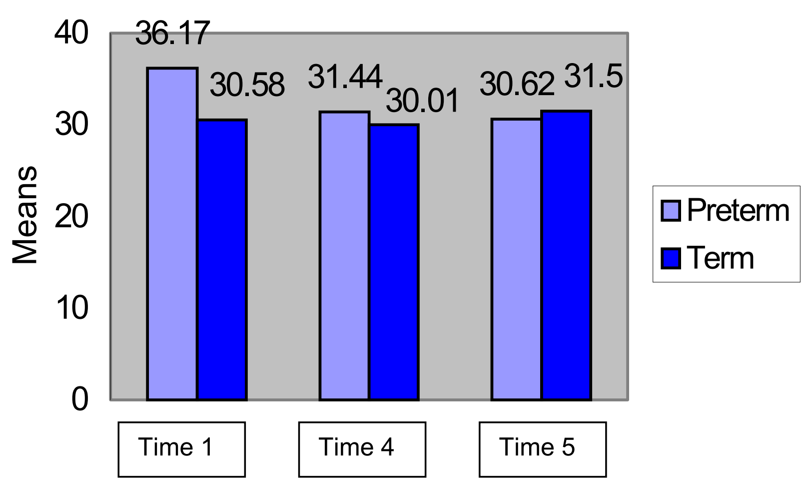
Using ANOVA for repeated measures (see Figure 7.4a) to analyse the results of self-reported stress showed that there were significant differences between the stress levels of the two groups of mothers, F (1,118) = 7.513, p < .007, at Time 1 (p < .001) only. There was also a significant interaction between time and gestation group, Wilks'Λ =.890, F (2, 117) = 7.220, p < .001 indicating that mothers of preterm infants were more stressed at Time 1, followed by Time 4 and Time 5. In the mothers of term infants, their self-reported stress decreased gradually from Time 1 to Time 5 but these changes were not statistically significant.

Figure 7.4a: Stress levels of mothers of preterm and term infants (N=120)

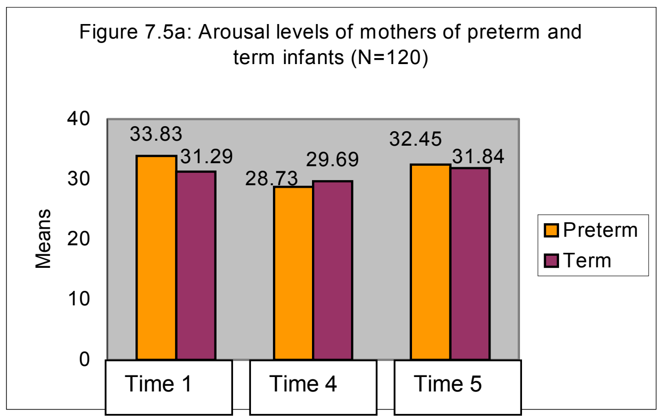


ANOVA for repeated measures showed no significant differences in stress reports between the fathers in the two groups , F (1, 117) = 1.785, p < .184. However, there was a significant interaction between time and gestation group, F (2, 234) = 10.008, p < .001 indicating that fathers of preterm infants were more stress at Time 1, followed by Time 4 and Time 5. Fathers of term infants were most stressed at Time 5, but there were no within group significant differences between their reports at Time 1 and Time 4 (see Figure 7.4b).

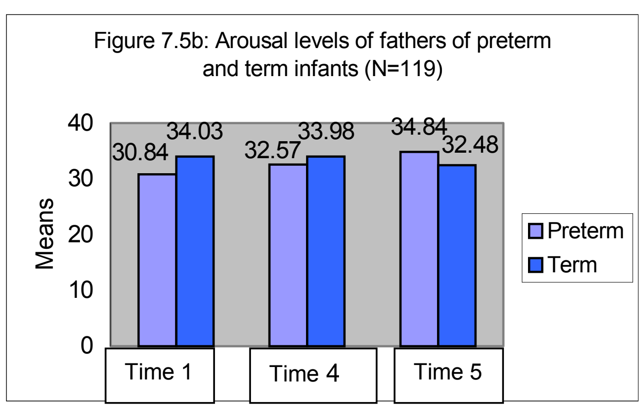
Figure 7.4b: Stress levels of fathers of preterm and term infants (N=119)



In evaluating the arousal subscale of the SACL using ANOVA for repeated measures results showed that there were no significant differences in the levels of the mothers' reports, $F(1, 118) = 1.038$, $p < .310$ nor were there any significant interactions between time and gestation group, Wilks'$\Lambda = .975$, $F(2, 117) = 1.522$, $p < .223$ (see Figure 7.5a).



In the fathers, there were no significant group differences in arousal levels $F(1, 117) = .599$, $p < .440$. However, there was a significant interaction with time, $F(2, 234) = 12.844$, $p < .001$. Fathers of preterm infants were more aroused in a reversed pattern, being most aroused at Time 5, followed by Times 4 and 1. However, fathers of term infants were more aroused at Time 1, with their scores gradually reducing over time (see figure 7.5b).



Hypothesis 3: There is a positive relation between self-reported stress and high levels of salivary cortisol and tribulin.

7.24 Pearson Correlation Coefficient

To test hypothesis 3, Pearson Correlation Coefficient was used to determine whether a relationship exists between self-reported stress and high levels of salivary cortisol and tribulin.

7.241 Relationships of biochemical markers and moods in mothers

The Pearson Correlation Coefficient was used to examine whether there was a relation between self-reported stress, using scores on trait-and state anxiety and anger, stress and arousal (SACL) and levels of cortisol in the mothers of both gestational groups. No relationships were found between cortisol and anxiety $r = -.028$, $p < .788$; anger $r = .068$, $p < .518$; stress $r = -.104$, $p < .316$; arousal $r = -.012$, $p < .905$; trait-anxiety $r = .064$, $p < .544$; or trait-anger $r = -.010$, $p < .922$. There were also no significant relationships between self-reported stress of anxiety $r = .071$, $p < .494$; anger $r = .078$, $p < .454$; stress (SACL) $r = .145$, $p < .165$; arousal $r = .141$, $p < .174$; trait-anxiety $r = .106$, $p < .307$; and trait-anger $r = .131$, $p < .208$; and levels of salivary tribulin.

7.242 Relationships of biochemical markers and moods in fathers

In the fathers, the correlation between self-reported stress as measured in trait-and state-anxiety and anger, stress and arousal, levels of salivary cortisol were also not apparent, anxiety $r = .000$, $p < 1.000$; anger $r =.024$

$p < .815$; stress (SACL) $r = .008$, $p < .941$; arousal $r = .009$, $p < .928$; trait-anxiety $r = -.028$, $p < .789$; and trait-anger $r = .137$, $p < .184$ indicating no relation between self-reported stress and salivary cortisol levels. There were also no significant relationships between the same measures of self-reported stress of anxiety $r = .099$, $p < .336$; anger $r = .025$, $p < .810$; stress (SACL) $r = .019$, $p < .858$; arousal $r = -.130$, $p < .207$; and trait-anxiety $r = .086$, $p < .406$; and levels of salivary tribulin. Trait-anger $r = .213$, $p < .038$ was moderately related and was the only correlation between self-reported stress and high salivary tribulin levels.

Hypothesis 4: Parents will use both problem-and emotion solving coping strategies to deal with stressful experiences. Results are shown in Tables 7.10b, p. 215; 7.10d, p. 216; 7.10f, p. 217; and 7.10h, p. 218.

7.25 Descriptive analyses of the reported stressors of parents of preterm and term infants.

The Ways of Coping Checklist developed by Aldwin and colleagues (1980) but revised by Vitaliano and colleagues (1985) was used to assess the ways of coping with stressors by parents of preterm and term infants. Table 7.10a, p. 214 shows that at Time 1, the mothers of preterm infants reported stress from their experiences of preterm labour and birth, prolonged rupture of membranes requiring hospitalisation, and concerns for the well being of the baby. For the mothers of term infants, the themes also included the labour and birth of the baby and the well being of the baby (see Table 7.10a). Three mothers of term infants perceived a gestation of over 40 weeks to be overdue and, given they were overdue at 41 weeks, this explained why they reported this as a concern.

Table 7.10a: Stressors of mothers (Time 1)

Stressors	Preterm N=60	N (%)	Term N=60
Labour/giving birth	23 (38%)		36 (60%)
Prolonged ruptured of membrane	7 (12%)		0 (0%)
Well being of baby	6 (10%)		5 (8%)
Induced labour	0 (0%)		2 (3%)
Overdue	0 (0%)		3 (5%)
Separation from baby	5 (8%)		0 (0%)
Family-related problems	2 (3%)		3 (5%)
Work-related problems	1 (2%)		1 (2%)
Others	4 (7%)		5 (8%)
No stressor written	9 (15%)		3 (5%)
Did not complete	3 (5%)		2 (3%)

Table 7.10b, p. 215 shows the coping strategies reported by mothers of both preterm and term infants at Time 1. Twenty-eight percent of mothers of preterm and term infants coped by seeking social support from their spouses, families or their friends. This category was followed by 25% utilising positive reappraisal of the stressful event, and 18% utilised escape-avoidance as an emotion management strategy. Several other strategies were each used by small numbers of mothers.

Table 7.10b: Coping strategies of mothers (Time 1)

	Preterm N=60	Term N=60 N (%)	Both N=120
Confrontative	4 (7%)	2 (3%)	6 (5%)
Distancing	3 (5%)	4 (7%)	7 (6%)
Self-controlling	4 (7%)	3 (5%)	7 (6%)
Seeking social support	15 (25%)	19 (32%)	34 (28%)
Accepting responsibility	4 (7%)	2 (3%)	6 (5%)
Escape-Avoidance	11 (18%)	11 (18%)	22 (18%)
Planful problem solving	4 (7%)	4 (7%)	8 (7%)
Positive reappraisal	15 (25%)	15 (25%)	30 (25%)

At Time 5, the stress experiences provided by 30% of mothers of preterm and 37% of the mothers of term infants related to family problems, the issue reported by most mothers in each group, and concerns for the well being of the baby (see Table 7.10c).

Table 7.10c: Stressors of mothers (Time 5)

Stressors	Preterm N=60	N (%)	Term N=60
Well being of baby	10 (17%)		10 (17%)
Personal well being	0 (0%)		5 (8%)
Family-related problems	18 (30%)		22 (37%)
Related to partner's work	2 (3%)		0 (0%)
Others	3 (5%)		4 (7%)
No stressors written	7 (12%)		11 (18%)
Did not fill questionnaire	3 (5%)		2 (3%)
Did not return questionnaire	17 (28%)		6 (10%)

At Time 5, 24% mothers of both groups reported seeking social support from their spouses, families or their friends, followed by 22% utilising reconstruction of the stressful event through positive reappraisal, 13% utilised escape-avoidance as an emotion management strategy, a reduction from Time 1. At Time 5 there was an increase of 6% who reported accepting responsibility for the stressful event (see Table 7.10d)

Table 7.10d: Coping strategies of mothers (Time 5)

	Preterm N=42	Term N=55 N (%)	Both N=97
Confrontative	2 (5%)	3 (5%)	5 (5%)
Distancing	4 (10%)	3 (5%)	7 (7%)
Self-controlling	4 (10%)	5 (9%)	9 (9%)
Seeking social support	10 (24%)	13 (24%)	23 (24%)
Accepting responsibility	2 (5%)	9 (17%)	11 (11%)
Escape-Avoidance	8 (19%)	5 (9%)	13 (13%)
Planful problem solving	3 (7%)	5 (9%)	8 (8%)
Positive reappraisal	9 (21%)	12 (22%)	21 (22%)

The themes of concerns provided by fathers of preterm infants at Time 1 referred to the well being of the partner and baby, the preterm labour of the partner, the birth of the baby and work-related stressors. The fathers of term infants, reported as stressors the labour of the partner and birth of the baby, the well being of the partner and baby and also stressors related to work (see Table 7.10e).

Table 7.10e: Stressors of fathers (Time 1)

Stressors	Preterm N=59	N (%)	Term N=60
Well being of partner/baby	24 (41%)		12 (20%)
Partner's labour/delivery	15 (25%)		25 (42%)
Work-related problems	6 (10%)		9 (15%)
Family-related problems	3 (5%)		3 (5%)
Others	7 (12%)		3 (5%)
No stressor written	9 (15%)		8 (13%)
Did not complete	2 (3%)		0 (0%)

Table 7.10f, p. 217 shows the coping strategies of fathers of both preterm

and term infants at Time 1. Thirty percent of the fathers of preterm and term infants reported seeking meaning of the stressful event positive reappraisal), followed by 21% seeking social support from spouses, friends and families, 14% utilised escape-avoidance and 11% utilised self-control, for example keeping their feelings to themselves and also trying to avoid others in general as an emotion-solving strategy.

Table 7.10f: Coping strategies of fathers (Time 1)

	Preterm N=59	Term N=60 N (%)	Both N=119
Confrontative	4 (7%)	3 (5%)	7 (6%)
Distancing	3 (5%)	5 (8%)	8 (7%)
Self-controlling	7 (12%)	6 (10%)	13 (11%)
Seeking social support	13 (22%)	12 (20%)	25 (21%)
Accepting responsibility	1 (2%)	2 (3%)	3 (3%)
Escape-Avoidance	8 (14%)	9 (15%)	17 (14%)
Planful problem solving	4 (7%)	6 (10%)	10 (8%)
Positive reappraisal	19 (32%)	17 (28%)	36 (30%)

The main theme of concern reported by both groups of fathers at Time 5 was related to work and family problems (see Table 7.10g).

Table 7.10g: Stressors of fathers (Time 5)

Stressors	Preterm N = 59	N (%)	Term N =60
Baby well being	3 (5%)		3 (5%)
Family-related problems	7 (12%)		8 (13%)
Work-related problems	14 (23%)		23 (38%)
Others	4 (7%)		2 (3%)
No stressors written	10 (17%)		15 (25%)
Did not fill questionnaire	5 (8%)		1 (2%)
Did not return questionnaire	16 (27%)		8 (13%)

At Time 5 (see Table 7.10h), 26% of the fathers of preterm and 22% fathers of term infants reported use of positive reappraisal, to the stressful event, followed by 17% and 20% seeking social support from spouses, friends and families respectively. The number of fathers using these coping strategies was slightly lower than at Time 1. At Time 5, again, most men used positive reappraisal (22%), 19 % used social support, 14% utilised escape-avoidance and 11% utilised self-control as an emotion-solving strategy. The number of fathers who utilised these two coping strategies remained the same at both Time 1 and Time 5.

Table 7.10h: Coping strategies of fathers (Time 5)

	Preterm N=42	Term N=55	Both N=97
		N (%)	
Confrontative	3 (7%)	4 (7%)	7 (7%)
Distancing	4 (10%)	5 (9%)	9 (9%)
Self-controlling	4 (10%)	7 (13%)	11 (11%)
Seeking social support	7 (17%)	11 (20%)	18 (19%)
Accepting responsibility	3 (7%)	4 (7%)	7 (7%)
Escape-Avoidance	7 (17%)	7 (13%)	14 (14%)
Planful problem solving	3 (7%)	5 (9%)	10 (10%)
Positive reappraisal	11 (26%)	12 (22%)	21 (22%)

Hypothesis 5: The high scores of psychological and psychosocial variables, the high levels of biochemical markers and demographic profiles of the infants and parents will predict stress for parents.

This hypothesis was tested using the regression modelling as shown in pp. 219-235.

7.26 Regression modelling: Hierarchical regression analyses

Several hierarchical regression analyses were employed to identify which variables predicted stress at Time 1 for mothers and fathers of the two groups and also at Time 5 after controlling for stress scores at Time 1. Sets of predictors were used instead of individual variables to manage an appropriate cases-to-IVs ratio (Tabachnick and Fiddell, 2001).

Mothers of the preterm gestational group

A hierarchical regression was employed to identify which variables predicted stress at Time 1 for mothers of preterm infants and five sets of predictors were entered in turn. The sets entered were as followed: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), maternal characteristics (set 4), and infants' characteristics (set 5).

The variables were transformed to reduce skewness and improve the normality. Logarithmic transformation was used on the state-anger variable and a square root transformation was used on the biochemical markers of stress. Missing data were dealt with by application of the Expectation-Maximisation approach.

The sets of predictors and results are shown in Table 7.11a, p. 220.

Table 7.11a: Hierarchical regression on set of predictors of stress for mothers of preterm infants at Time 1 (n=47)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychological predictors (set 1)			.683	17.676	<.001
State-anxiety	.820 (.314)**	.839 (.135)**			
State-anger (Log10)	.138 (15.39)				
Arousal	-.033 (.150)				
Trait-anxiety	.084 (.374)				
Trait-anger	-.096 (.423)				
Psychosocial predictors (set 2)			.705	.699	.598
Relationship quality	-.080 (1.33)				
Social support:					
Number of perceived supporters	-.059 (.121)				
Satisfaction with perceived support	.242 (.370)*	.092 (.206)			
SCN experience	-.058 (1.09)				
Biochemical markers of stress (set 3)			.736	2.027	.147
Cortisol (Square root)	-.055 (1.33)				
Tribulin (Square root)	.101 (1.10)				
Maternal characteristics (set 4)			.766	1.005	.420
Age	.053 (.295)				
Education	.202 (.891)				
Occupation	.161 (1.15)				
Parity	-.050 (3.01)				
Infant's characteristics (set 5)			.811	2.212	.109
Gestation	-.298 (1.23)	-.048 (.706)			
Birth weight	.183 (.004)				
Length of hospitalisation	-.196 (.175)				

After step 1, with psychological predictors in the equation, R^2=.683, F (5, 41)=17.676, p < .001. After step 2, with psychosocial predictors added to prediction of stress by psychological predictor, R^2=.705, F(4, 37)=.699, p<.598. Thus addition of psychosocial predictor to the equation results in a slight increment in R^2 of 3%. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial

sets, R^2=.736, F(2, 35)=2.027, p < .147. Thus addition of biochemical markers of stress to the equation results in a moderate improvement in R^2. After step 4, with maternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.766, F(4, 31)=1.005, p < .420. Thus addition of maternal characteristics to the equation also results in a moderate increment in R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and maternal characteristics sets, R^2=811, F (3, 28)=2.212, p < .109. Therefore, addition of infant's characteristics to the equation had greatly improved the R^2. Except for psychological set, all other sets were not significant.
In the univariate analysis of individual variables, the best predictors were state-anxiety (p < .001), satisfaction with perceived support (p < .038), and gestation of the infant (p < .036). However at the multivariate level, the best predictor of stress was only state-anxiety (p < .001).

The analysis evaluated how stress at Time 5 for mothers of preterm infants was predicted controlling for the level of stress scores at Time 1. The variables set entered were as followed: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), maternal characteristics (set 4), and infants' characteristics (set 5). The sets of predictors and results are shown in Table 7.11b, p. 222.

Table 7.11b: Hierarchical regression on set of predictors of stress for mothers of preterm infants at Time 5 controlling for stress at Time 1 (n= 47)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychological variables (set 1)			.790	25.074	<.001
State-anxiety	.410 (.281)**				
State-anger (Log 10)	.112 (20.69)				
Arousal	-.072 (.150)				
Trait-anxiety	.196 (.290)				
Trait-anger	.230 (.290)				
Psychosocial predictors (set 2)			.797	.409	.747
Relationship quality	.071 (.883)				
Social support:					
Number of perceived supporters	.021 (.083)				
Satisfaction with perceived support	-.065 (.251)				
Biochemical markers of stress (set 3)			.806	.812	.452
Cortisol (Square root)	.066 (1.32)				
Tribulin (Square root)	.129 (.774)				
Maternal characteristics (set 4)			.822	.726	.581
Age	-.019 (.172)				
Education	-.014 (.097)				
Occupation	.039 (.789)				
Parity	.135 (2.09)				
Infant's characteristics (set 5)			.838	.887	.460
Gestation	-.023 (.883)				
Birth weigh	.024 (.003)				
Length of hospitalisation	-.161 (.118)				

After step 1, with psychological predictors in the equation, R^2=.790, F (6, 40)=25.074, p < .001. After step 2, with psychosocial predictors added to prediction of stress by psychological predictors, R^2=.797, F(3, 37)=.409, p < .747. Thus addition of psychosocial predictors to the equation did not improve the R^2. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial sets, R^2=.806, F(2, 35)=.812, p < .452. Thus addition of biochemical markers of stress to the equation also did not inprove the R^2. After step 4, with maternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.822, F(4, 31)=.726, p < .581. Thus addition of maternal characteristics to the equation results in a slight increment in R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and maternal characteristics sets, R^2=838, F (3, 28)=.887, p < .406. Therefore, addition of infant's characteristics to the equation had slightly improved the R^2. Except for psychological set, all other sets were not significant.

Mothers of the term gestational group

A hierarchical regression was employed to identify which variables predicted stress at Time 1 for mothers of term infants, five set of predictors were entered in turn. The variables set entered were as followed: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), maternal characteristics (set 4), and infants' characteristics (set 5).

The variables were transformed to reduce skewness and improve the normality. Logarithmic transformation was used on the state-anger variable and a square root transformation was used on the biochemical markers of stress. Missing data were dealt with by Expectation-Maximisation approach.

The sets of predictors and results are shown in Table 7.11c.

Table 7.11c: Hierarchical regression on set of predictors of stress for mothers of term infants at Time 1 (n=47)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychological predictors (set 1)			.633	14.115	<.001
State-anxiety	.555 (.253)**	.703 (.170)**			
State-anger (Log10)	.314 (19.13)*	.152 (14.18)			
Arousal	.029 (.133)				
Trait-anxiety	-.058 (.326)				
Trait-anger	.195 (.328)				
Psychosocial predictors (set 2)			.668	1.340	.276
Relationship quality	-.117 (1.00)				
Social support:					
Number of perceived supporters	-.121 (.648)				
Satisfaction with perceived support	.037 (.587)				
Biochemical markers of stress (set 3)			.673	.307	.737
Cortisol (Square root)	-.060 (1.30)				
Tribulin (Square root)	.091 (1.06)				
Maternal characteristics (set 4)			.711	1.041	.401
Age	.137 (.213)				
Education	-.189 (.787)				
Occupation	-.104 (.832)				
Parity	-.063 (2.28)				
Infant's characteristics (set 5)			.717	.218	.883
Gestation	-.102 (.941)				
Birth weight	.028 (.003)				
Length of hospitalisation	-.095 (.976)				

After step 1, with psychological predictors in the equation, R^2=.633, F (5, 41)=14.115, p < .001. After step 2, with psychosocial predictors added to prediction of stress by psychological predictors, R^2=.668, F(3, 38)=1.340, p < .276. Thus addition of psychosocial predictors to the equation results in a moderate increment in R^2. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial sets, R^2=.673, F(2, 36)=.307, p < .737. Thus addition of biochemical markers of stress to the equation did not improve the R^2. After step 4, with maternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.711, F(4, 32)=1.041, p < .401. Thus addition of maternal characteristics to the equation results in a moderate increment in R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and maternal characteristics sets, R^2=717, F (3, 29)=.218, p < .883. Therefore, addition of infant's characteristics to the equation did not improve the R^2. Except for psychological set, all other sets were not significant.

In the univariate analysis of individual variables, the best predictors were state-anxiety (p < .001), and state-anger (p < .041). However at the multivariate level, the best predictor was only state-anxiety (p < .001).

The analysis evaluated how stress at Time 5 for mothers of term infants was predicted controlling for the level of stress scores at Time 1. The variables set entered were as followed: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), maternal characteristics (set 4), and infants' characteristics (set 5). The sets of predictors and results are shown in Table 7.11d, p. 226.

Table 7.11d: Hierarchical regression on set of predictors of stress for mothers of term infants at Time 5 controlling for stress at Time 1 (n= 46)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychological variables (set 1)			.770	21.732	<.001
State-anxiety	.661 (.242)**	.772 (.142)**			
State-anger (Log 10)	.005 (19.13)				
Arousal	-.053 (.127)				
Trait-anxiety	.188 (.221)				
Trait-anger	-.029 (.262)				
Psychosocial predictors (set 2)			.834	4.637	.008
Relationship quality	-.054 (.839)				
Social support:					
Number of perceived supporters	.057 (.888)				
Satisfaction with perceived support	-.213 (.171)*	-.216 (.147)**			
Biochemical markers of stress (set 3)			.835	.116	.891
Cortisol (Square root)	.066 (1.32)				
Tribulin (Square root)	.129 (.774)				
Maternal characteristics (set 4)			.858	1.201	.331
Age	-.122 (.232)				
Education	-.165 (.672)				
Occupation	-.093 (.687)				
Parity	-.010 (2.39)				
Infant's characteristics (set 5)			.875	1.239	.315
Gestation	-.105 (.873)				
Birth weight	.123 (.003)				
Length of hospitalisation	-.041 (.824)				

After step 1, with psychological predictors in the equation, R^2=.770, F (6, 39)=21.732, p < .001. After step 2, with psychosocial predictors added to prediction of stress by psychological predictors, R^2=.834, F(3, 36)=4.637, p < .008. Thus addition of psychosocial predictors to the equation significantly improved the R^2. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial sets, R^2=.835, F(2, 34)=.116, p < .891. Thus addition of biochemical markers of stress to the equation did not improve the R^2. After step 4, with maternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.858, F(4, 30)=1.201, p < .331. Thus addition of maternal characteristics to the equation results in a slight increment in R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and maternal characteristics sets, R^2=875, F (3, 27)=1.239, p < .315. Therefore, addition of infant's characteristics to the equation had slightly improved the R^2. Only the psychological and psychosocial sets were significant.

In the univariate analysis of individual variables, the best predictors were state-anxiety (p < .001), and satisfaction with perceived support (p <. 021). However at the multivariate level, the best predictors were state-anxiety (p < .001) and satisfaction with perceived support (p < .001).

Fathers of the preterm gestational group

A hierarchical regression was employed to identify which variables predicted stress at Time 1 for fathers of preterm infants, five set of predictors were entered in turn. The variables set entered were as follows: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), paternal characteristics (set 4), and infants' characteristics (set 5).

The variables were transformed to reduce skewness and improve the normality. Logarithmic transformation was used on the state-anger variable. Missing data were dealt with by Expectation-Maximisation approach.

The sets of predictors and results are shown in Table 7.11e.

Table 7.11e: Hierarchical regression on set of predictors of stress for fathers of preterm infants at Time 1 (n=39)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychological predictors (set 1)			.721	17.055	<.001
State-anxiety	.449 (.288)**	.676 (.147)**			
State-anger (Log10)	.251 (13.16)				
Arousal	-.316 (.152)**	-.286 (.133)**			
Trait-anxiety	.386 (.339)				
Trait-anger	-.148 (.333)				
Psychosocial predictors (set 2)			.758	1.097	.377
Relationship quality	-.208 (.957)				
Social support:					
Number of perceived supporters	-.092 (.106)				
Satisfaction with perceived support	.175 (.173)				
SCN experience	-.086 (1.22)				
Biochemical markers of stress (set 3)			.763	.295	.747
Cortisol	-.007 (.271)				
Tribulin	.058 (.246)				
Paternal characteristics (set 4)			.772	.288	.920
Age	-.082 (.189)				
Education	.083 (1.05)				
Occupation	-.240 (.897)				
Parity	-.071 (2.40)				
Infant's characteristics (set 5)			.830	2.264	.112
Gestation	.119 (1.77)				
Birth weight	-.336 (.005)				
Length of hospitalisation	-.358 (.183)				

After step 1, with psychological predictors in the equation, R^2=.721, F (5, 33)=17.055, p < .001. After step 2, with psychosocial predictors added to prediction of stress by psychological predictors, R^2=.758, F(4, 29)=1.097, p < .377. Thus addition of psychosocial predictors to the equation results in a moderate increment in R^2. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial sets, R^2=.763, F(2, 27)=.295, p < .747. Thus addition of biochemical markers of stress to the equation did not improve the R^2. After step 4, with paternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.772, F(4, 23)=.228, p < .920. Thus addition of paternal characteristics to the equation did not improve the R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and paternal characteristics sets, R^2=830, F (3, 20)=2.264, p < .112. Therefore, addition of infant's characteristics to the equation had greatly improved the R^2. The psychological set was significant and a trend towards significant for the infant's characteristics.

In the univariate analysis of individual variables, the best predictors were state-anxiety (p < .005), arousal (p < .009), At the multivariate level, the best predictors were state-anxiety (p < .001), and arousal (p < .001).

The analysis evaluated how stress at Time 5 for fathers of preterm infants were predicted controlling for the level of stress scores at Time 1. The variables set entered were as follows: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), paternal characteristics (set 4), and infants' characteristics (set 5). The sets of predictors and results are shown in Table 7.11f,

Table 7.11f: Hierarchical regression on set of predictors of stress for fathers of preterm infants at Time 5 controlling for stress at Time 1 (n= 43)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychosocial variables (set 1)			.796	23.477	<.001
State-anxiety	.512 (.309)**				
State-anger (Log 10)	-.271 (12.35)				
Arousal	-.109 (.189)				
Trait-anxiety	.432 (.335)				
Trait-anger	.125 (.285)				
Psychosocial predictors (set 2)			.804	.432	.731
Relationship quality	-.087 (.858)				
Social support:					
Number of perceived supporters	-.095 (.107)				
Satisfaction with perceived support	-.044 (.281)				
Biochemical markers of stress (set 3)			.821	1.429	.255
Cortisol	-.096 (.284)				
Tribulin	-.130 (.131)				
Paternal characteristics (set 4)			.843	.966	.442
Age	-.068 (.126)				
Education	.021 (.673)				
Occupation	.058 (.545)				
Parity	.095 (2.14)				
Infant's characteristics (set 5)			.872	1.789	.176
Gestation	-.113 (.799)				
Birth weight	.053 (.003)				
Length of hospitalisation	-.232 (.127)				

After step 1, with psychological predictors in the equation, R^2=.796, F (6, 46)=23.477, p < .001. After step 2, with psychosocial predictors added to prediction of stress by psychological predictors, R^2=.804, F(3, 33)=.432,

$p < .731$. Thus addition of psychosocial predictors to the equation did not improve the R^2. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial sets, R^2=.821, F(2, 31)=1.429, $p < .255$. Thus addition of biochemical markers of stress to the equation results in a slight improvement in R^2. After step 4, with paternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.843, F(4, 27)=.966, $p < .442$. Thus addition of paternal characteristics to the equation results in a slight increment in R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and paternal characteristics sets, R^2=872, F (3, 24)=1.789, $p < .176$. Therefore, addition of infant's characteristics to the equation had slightly improved the R^2. Only the psychological set was significant.

<u>Fathers of the term gestational group</u>

A hierarchical regression was employed to identify which variables predicted stress at Time 1 for fathers of term infants, five set of predictors were entered in turn. The variables set entered were as follows: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), paternal characteristics (set 4), and infants' characteristics (set 5).

The variables were transformed to reduce skewness and improve the normality. Logarithmic transformation was used on the state-anger variable. Missing data were dealt with by Expectation-Maximisation approach.

The sets of predictors and results are shown in Table 7.11g.

Table 7.11g: Hierarchical regression on set of predictors of stress for fathers of term infants at Time 1 (n=48)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychological predictors (set 1)			.811	36.081	<.001
State-anxiety	.649 (.263)	.853(.137)**			
State-anger (Log10)	.130 (13.55)				
Arousal	-.137 (.151)				
Trait-anxiety	.184 (.266)				
Trait-anger	-.034 (.253)				
Psychosocial predictors (set 2)			.826	1.085	.367
Relationship quality	.001 (1.44)				
Social support:					
Number of perceived supporters	-.217 (.078)*	-.020 (.058)			
Satisfaction with perceived support	.103 (.425)				
Biochemical markers of stress (set 3)			.833	.773	.469
Cortisol (Square root)	-.022 (.183)				
Tribulin (Square root)	-.094 (.109)				
Paternal characteristics (set 4)			.850	.936	.455
Age	-.103 (.171)				
Education	-.107 (.655)				
Occupation	-.006 (.922)				
Parity	-.032 (1.95)				
Infant's characteristics (set 5)			.865	1.098	.365
Gestation	.250 (.604)				
Birth weight	.051 (.002)				
Length of hospitalisation	-.105 (.267)				

After step 1, with psychological predictor in the equation, R^2=.811, F (5, 42)=36.081, $p < .001$. After step 2, with psychosocial predictor added to prediction of stress by psychological predictor, R^2=.826, F(3, 39)=1.085, $p < .367$. Thus addition of psychosocial predictor to the equation results in a slight increment in R^2. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial sets, R^2=.833, F(2, 37)=.773, $p < .469$. Thus addition of biochemical markers of stress to the equation did not improve the R^2. After step 4, with paternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.850, F(4, 33)=.936, $p < .455$. Thus addition of paternal characteristics to the equation results in a slight increment in R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and paternal characteristics sets, R^2=865, F (3, 30)=1.098, $p < .365$. Therefore, addition of infant's characteristics to the equation improved slightly the R^2. Only psychological set was significant.

In the univariate analysis of individual variables, the best predictors were state-anxiety ($p < .001$), and number of perceived supporters ($p < .023$). However at the multivariate level, the best predictor was only state-anxiety ($p < .001$).

The analysis evaluated how stress at Time 5 for fathers of term infants was predicted controlling for the level of stress scores at Time 1. The variables set entered were as follows: psychological\emotion variables (set 1), psychosocial variables (set 2), biochemical markers of stress (set 3), paternal characteristics (set 4), and infants' characteristics (set 5). The sets of predictors and results are shown in Table 7.11h.

Table 7.11h: Hierarchical regression on set of predictors of stress for fathers of term infants at Time 5 controlling for stress at Time 1 (n= 46)

	Univariate (B(SEB)	Multivariate (B(SEB)	R^2	F^2 change	p
Psychological variables (set 1)			.710	15.949	<.001
State-anxiety	.281 (.324)				
State-anger (Log 10)	.316 (14.93)*	.483 (10.81)**			
Arousal	.161 (.174)				
Trait-anxiety	.270 (.334)				
Trait-anger	-.059 (.267)				
Psychosocial predictors (set 2)			.730	.868	.467
Relationship quality	-.192 (1.16)				
Social support:					
Number of perceived supporters	.066 (.098)				
Satisfaction with perceived support	.176 (.548)				
Biochemical markers of stress (set 3)			.759	2.079	.141
Cortisol (Square root)	.066 (1.32)				
Tribulin (Square root)	.129 (.774)				
Paternal characteristics (set 4)			.779	.659	.625
Age	-.122 (.232)				
Education	-.165 (.672)				
Occupation	-.093 (.687)				
Parity	-.010 (2.39)				
Infant's characteristics (set 5)			.796	.739	.538
Gestation	-.105 (.873)				
Birth weight	.123 (.003)				
Length of hospitalisation	-.041 (.824)				

After step 1, with psychological predictor in the equation, R^2=.710, F (6, 39)=15.949, p < .001. After step 2, with psychosocial predictor added to prediction of stress by psychological predictor, R^2=.730, F(3, 36)=.868, P < .467. Thus addition of psychosocial predictor to the equation slightly improved the R^2. After step 3, with biochemical markers of stress added to predictions of stress by psychological and psychosocial sets, R^2=.759, F(2, 34)=2.079, p < .141. Thus addition of biochemical markers of stress to the equation moderately improve the R^2. After step 4, with paternal characteristics added to predictions of stress by psychological, psychosocial, and biochemical markers of stress sets, R^2=.779, F(4, 30)=.659, p < .625. Thus addition of paternal characteristics to the equation results in a slight increment in R^2. After step 5, with infant's characteristics added to predictions of stress by psychological, psychosocial, biochemical markers of stress, and paternal characteristics sets, R^2=796, F (3, 27)=.739, p < .538. Therefore, addition of infant's characteristics to the equation had slightly improved the R^2. Except for psychological set, all other sets were not significant.

In the univariate analysis of individual variables, the best predictors were state-anger (p < .039), and salivary cortisol (p < .037). However at the multivariate level, the best predictors were only state-anger (p < .001).

7.27 Regression modelling: Standard regression analyses

Hypothesis 6: The availability of high social support would buffer the impact of stress on parents of preterm and term infants.

Separate standard regression equations were carried out to examine whether social support mediated stress experiences in the mothers in both gestational groups.

The variables were transformed to reduce skewness and improve the normality. Logarithmic transformation was used on the state-anger variable and a square root transformation was used on the biochemical markers of stress. Missing data were dealt with by application of the Expectation-Maximisation approach.

Table 7.12a shows the predictors of stress for mothers in both groups in relation to the the number of perceived supporters. These results indicated that having a high number of perceived supporters was predicted by low inverse values of self-reported stress (SACL) p < .005 in the mothers.

Table 7.12a: Standard regression on stress variables for mothers in both groups according to number of perceived supporters (n= 120)

	Univariate (B(SEB)	R^2	p
State-anxiety	-.125 (.047)	.016	.175
State-anger (Log 10)	-.097 (.001)	.009	.293
Stress	-.253 (.084)	.064	.005**
Arousal	-.134 (.068)	.018	.146
Trait-anxiety	-.117 (.032)	.014	.202
Trait-anger	-.069 (.028)	.005	.452
Cortisol (Square root)	.040 (.010)	.002	.699
Tribulin (Square root)	-.174 (.011)	.030	.094

**p < 0.01 *p < 0.05

Table 7.12b shows the predictors of stress for mothers in both groups in relation to their satisfaction with perceived supports. These results indicated that mothers' satisfaction with perceived supports was predicted by low levels of anger ($p < .017$) and arousal ($p < .002$), and low trait-anxiety ($p < .004$) and trait-anger ($p < .003$).

Table 7.12b: Standard regression on stress variables for mothers in both groups according to satisfaction of perceived support (n= 120)

	Univariate (B(SEB)	R^2	p
State-anxiety	-.140 (.159)	.020	.127
State-anger (Log 10)	-.218 (.002)	.047	.017*
Stress	-.044 (.296)	.002	.632
Arousal	-.280 (.226)	.079	.002**
Trait-anxiety	-.259 (.105)	.067	.004**
Trait-anger	-.271 (.094)	.074	.003**
Cortisol (square root)	-.007 (.037)	.000	.945
Tribulin (square root)	-.076 (.044)	.006	.464

$^{**}p < 0.01$ $^{*}p < 0.05$

The same procedures were carried out for the fathers in both gestational groups. The variables were transformed to reduce skewness and improve the normality. Logarithmic transformation was used on the state-anger variable. Missing data were dealt with by application of the Expectation-Maximisation approach.

Table 7.12c, p.238 shows the predictors of stress for the fathers in both gestational groups in relation to the number of perceived supporters. These results indicated that there was no predictive relationship between having a high number of perceived supporters and stress variables in the fathers.

Table 7.12c: Standard regression on stress variables for fathers in both groups according to number of perceived supporters (n= 119)

	Univariate (B(SEB)	R^2	p
State-anxiety	-.112 (.041)	.013	.225
State-anger (Log 10)	-.094 (.001)	.009	.308
Stress	-.139 (.076)	.019	.130
Arousal	.010 (.050)	.000	.915
Trait-anxiety	-.124 (.035)	.015	.178
Trait-anger	-.037 (.029)	.001	.691
Cortisol	-.127 (.033)	.016	.217
Tribulin	-.066 (.054)	.004	.522

**p < 0.01 *p < 0.05

Table 7.12d shows the stress predictors for fathers in both groups in relation to their satisfaction with perceived supports. These analyses indicated that fathers' satisfaction with perceived supports was predicted by inverse levels of anxiety ($p < .003$), anger ($p < .007$), self-reported stress (SACL) ($p < .001$), and trait-anxiety ($p < .001$). While arousal (SACL) ($p < .001$) was directly predictive at this time.

Table 7.12d: Standard regression on stress variables for fathers in both groups according to satisfaction with perceived support (n= 119)

	Univariate (B(SEB)	R^2	p
State-anxiety	-.267 (.089)	.072	.003**
State-anger (Log 10)	-.248 (.001)	.062	.007**
Stress	-.294 (.163)	.087	.001**
Arousal	.329 (.104)	.108	<.001**
Trait-anxiety	-.373 (.071)	.139	<.001**
Trait-anger	-.146 (.063)	.021	.113
Cortisol	-.001 (.071)	.000	.991
Tribulin	-.131 (.114)	.017	.202

**p < 0.01 *p < 0.05

7.3 **Comparing the experiences of mothers and fathers of preterm infants**

7.31 Subjective measures of stress

Both partners of the couples completed self-report measures of stress on five occasions using the STPI (Spielberger, 1970) and SACL Scales (Gotts and Cox, 1988) which were analysed using univariate analysis.

Table 7.13 shows the univariate analyses of the self-report measures of parents of preterm infants.

Table 7.13: Univariate analysis of measures for parents of preterm infants

		Mothers		Fathers		
Variables	Time	N	M (sd)	N	M (sd)	p
State-anxiety	1	58	21.6 (6.8)	55	19.9 (5.9)	.167
	2	52	20.4 (6.1)**	45	17.1 (5.9)	.009
	3	32	20.4 (4.3)	30	18.1 (6.0)	.088
	4	48	17.4 (5.0)	45	16.3 (5.2)	.453
	5	41	14.4 (4.5)	42	15.7 (4.7)	.185
State-anger	1	57	12.0 (3.2)	57	12.1 (3.6)	.761
	2	52	11.6 (2.9)	46	11.6 (3.7)	.992
	3	32	10.8 (1.6)	30	11.7 (4.4)	.304
	4	48	11.6 (2.3)	46	12.0 (3.9)	.552
	5	41	11.3 (3.3)	43	12.0 (4.4)	.474
Stress	1	53	40.2 (12.6)	54	35.8 (11.1)	.061
	2	48	40.1 (13.4) *	46	34.7 (12.5)	.050
	3	29	36.7 (9.6)	30	34.0 (11.2)	.322
	4	45	34.7 (9.5)	45	32.0 (11.2)	.218
	5	41	29.5 (9.1)	40	29.3 (9.2)	.888
Arousal	1	57	27.4 (6.7)**	54	31.0 (6.8)	.006
	2	52	29.1 (7.3)*	45	31.9 (6.3)	.043
	3	30	27.7 (6.6)*	30	31.9 (6.5)	.016
	4	46	28.8 (7.1)*	44	32.1 (6.3)	.023
	5	40	33.0 (7.3)	42	35.9 (7.2)	.073
Trait-anxiety	1	51	18.1 (5.0)	57	17.7 (5.2)	.715
	5	57	18.3 (4.0)	57	17.0 (4.1)	.097
Trait-anger	1	42	18.2 (4.8)	40	16.2 (4.7)	.055
	5	39	17.4 (3.8)	43	16.7 (3.7)	.374

** $p < 0.01$ *$p < 0.05$

Univariate analyses showed that for the mothers, anxiety was highest at Time 1 and gradually reduced at each of the subsequent time phases. Only at Time 2 was there a significant difference between the mothers' and fathers' experiences demonstrating the mothers were stressed at Time 2. However, mothers reported arousal levels which were inversely related meaning that they had high stress levels but low arousal levels, while the fathers reported low stress levels but high arousal levels.

7.32 Objective measures of stress

Table 7.14 shows the cortisol and tribulin levels in parents of preterm infants at each of the 5 time periods.

Table 7.14: Cortisol and tribulin levels of mothers and fathers of preterm infants

	Mothers		Fathers	
	Cortisol (nmol/L)			
	N	M (± SEM)	N	M (± SEM)
Time 1	38	4.1 (0.6)	46	4.6 (0.6)
Time 2	41	4.6 (0.6)	38	4.5 (0.8)
Time 3	28	4.2 (0.7)	29	4.6 (0.7)
Time 4	39	5.5 (1.1)	38	4.3 (0.9)
Time 5	35	4.1 (0.6)	38	4.7 (0.9)
	Tribulin (%)			
Time 1	34	7.2 (1.0)	39	7.8 (1.1)
Time 2	30	12.5 (1.8)	29	10.8 (1.6)
Time 3	16	11.5 (2.6)	16	8.5 (1.7)
Time 4	23	10.3 (2.2)	27	9.1 (1.5)
Time 5	26	10.8 (1.7)	29	10.5 (1.4)

Cortisol: There were no significant differences between the mothers and fathers in their cortisol levels at each time period. Within each group, mothers reported their highest cortisol levels at Time 4 which had increased by 34% from Time 1, but returned to near baseline at Time 5. For the fathers, there were no differences in the levels at all five time periods. All the levels of the mothers and fathers were either within or slightly above the norms.

Tribulin: Except for Time 1, mothers returned higher levels than the fathers. Within each group, the mothers' highest level was at Time 2, which had increased by 72% from Time 1 and gradually decreased at Time 5. The fathers' highest level was also at Time 2 and had increased by 38% from Time 1. At Time 3, the levels were decreased but at Times 4 and 5 the levels increased slightly. All the levels of the mothers and fathers were lower than the norms.

7.33 Stressors experienced by parents of infants in SCN

To find out the effects of stressors which were perceived as the most potent by the parents with infants in SCN, the Parental Stress Scale: Neonatal Intensive Care Unit (Miles, 1987) was modified to be used in SCN. Two items, including the presence of a respirator and chest drain were removed from the questionnaire because all infants requiring such support would have been nursed in NICU and not in SCN.

Table 7.15a shows the reported perceived stressors of the parents in SCN at Time 1.

Table 7.15a: Comparison of mothers' and fathers' mean scores on parental stressors in SCN (Time 1)

Dimensions	Mothers N=60	(M)	Fathers N=59	p
Sights and sounds	12.45		9.43	.001
Infants' appearance and behaviour	30.67		25.39	NS
Parental role alteration	25.91		16.50	<.001
Staff communication and relations	8.56		8.39	NS
Overall SCN experience	3.62		2.57	<.001

The stressors perceived by the parents as the most potent were the appearance and behaviours of the infant, followed by the delay in being able to perform the parental role, the sights and sounds of the nursery environment, and staff behaviours and style or quality of their communication. There were significant differences between the mothers and fathers in both the sights and sounds of the nursery and the delay in performing parental role. However, mothers more than fathers found the overall SCN experience more stressful.

Table 7.15b (p. 243) shows the perceived stressors of the parents in SCN at Time 2.

Table 7.15b: Comparison of mothers' and fathers' mean scores on parental stressors in SCN (Time 2)

Dimensions	Mothers (M) N= 52	Fathers N=48	p
Sights and sounds	8.56	6.83	NS
Infants' appearance and behaviour	25.20	19.44	NS
Parental role alteration	22.08	14.30	<.001
Staff communication and relations	8.67	8.64	NS
Overall SCN experience	3.59	2.40	<.001

At Time 2, the stressors affecting the parents were the appearance and behaviours of the infant, followed by the delay in being able to perform the parental role, staff behaviours and style or quality of their communication and the sights and sounds of the nursery environment. The order of this total experience had changed for the mothers and fathers. At Time 1, the mothers were affected most by the sights and sounds of the nursery environment, followed by the staff behaviours and communication style, but at Time 2 they were less affected by the sights and sounds. At Time 1, the fathers were affected most by the sights and sounds of the nursery environment, followed by the staff behaviours and communication style, but at Time 2 it was vice versa. The significant differences between the couples' reports were the delay in performing the parental role and the overall SCN experience with the mothers reporting more stress with these two items than the father did.

7.34 <u>Stressful effects of the SCN experiences in Mothers</u>

At Time 1, measured by the modified PSS: NICU (Miles, 1987), the item affecting mothers the most, to which they responded with greater stress from the items of subscale “sights and sounds of the nursery” were the (a): *sudden noises of monitor alarms* (82%), and (b) *the large number of people working in the nursery* (30%). At Time 2, the number of respondents reporting these items had reduced to 50% and 18% respectively.

For the subscale “infant’s appearance and behaviour,” the item reported as the most stressful was the *tubes and equipment on or near my baby* (80%), and the item responded to the least was *seeing my baby stop breathing* (13%). This is understandable because few babies in SCN have apnoea episodes compared with infants in NICU so this was an actual event of low occurrence. However, at Time 2, mothers reported the most stressful item was [seeing] *my baby being fed by intravenous line or tube* (60%), and the least stress provoking item was the *wrinkled appearance of my baby* (12%).

For the subscale “parental role alteration or delay in performing the parental role,” the most stressful item was *being separated from my baby* (95%), although at Time 2 this response level had reduced somewhat, with 82% of mothers who reported the item as stressful. The least stressful item was *sometimes forgetting what my baby looks like* although a third of the mothers reported this but at Time 2 the mothers reported the least stressful item as perceived *staff closer to my baby than I am* (20%).

For the subscale “staff behaviours and communication,” the most stressful item was *not telling me enough about tests and treatments being done to my baby* (40%), and the least stressful item was *staff acting as if they do not understand my baby’s behaviour or special needs* (13%). At Time 2, the percentage of mothers reporting the same stressors remained unchanged.

7.35 Stressful effects of the SCN experiences in fathers

The fathers reported experiencing similar stressors to those of the mothers. However, the difference found was in the level reported than the type of stressors. At Time 1, the item experienced most stressful/least stressful for the dimension “sights and sounds of the nursery” was the *sudden noises of monitor alarms* (68%), and the *large number of people working in the nursery* (17%). At Time 2, responses to the first item had reduced to 42% but responses to the second item remained unchanged.

For the item “infant’s appearance and behaviour,” the most stressful item was the *tubes and equipment on or near my baby* and the *small size of my baby* for 57% of fathers, and the least stressful item was *seeing my baby stop breathing* (20%). However at Time 2, only 40% of the fathers reported that they were stressed by the *small size of the baby.*

For the item "parental role alteration or delay in performing the parental role," the most stressful item was *being separated from my baby* (72%) and responses reduced to 65% at Time 2, and the least stressful item was *feeling staff are closer to my baby than I am* (18%), at Time 2 the least stressful item changed to *sometimes forgetting what my baby looks like* (8%).

For the item "staff behaviours and communication," the most stressful items were *not telling me enough about tests and treatments being done to my baby* (30%), and that remained unchanged at Time 2.

7.4 **Summary**

7.41 Mothers of preterm and term infants

The results reported in this study indicated that mothers of preterm infants were significantly stressed at Time 1 but less stressed at Time 5. Mothers of preterm infants were also more prone to depression at Time 1 compared to mothers of term infants. Even though mothers of preterm infants were stressed at Time 1 their cortisol levels were lower than in the mothers of term infants. However, there were no differences in the tribulin levels for mothers of both groups and values were within the norms (Hucklebridge et al., 1998). The predictors of stress for parents of preterm and term infants were found to be from psychological and psychosocial variables. The mothers in both groups used both problem- and emotion coping strategies to deal with their stressful situation.

7.42 <u>Fathers of preterm and term infants</u>

The fathers of preterm infants also reported more negative moods of anxiety and self-reported stress (SACL) at Time 1 than did the fathers of term infants. Event though fathers of preterm infants reported greater stress levels at Time 1, their arousal levels were lower than in the fathers of term infants indicating that self-reported stress and arousal were inversely related. The predictors of stress for the fathers of both groups were also from psychological and psychosocial variables. Fathers in both groups used problem- and emotion-solving strategies to cope with their stressful situation.

7.43 <u>Mothers and fathers of preterm infants</u>

Comparing the experiences of mothers and fathers of preterm infants, the mothers were more anxious at Time 1 and stressed at Time 2 compared to the fathers. The only time that the differences were significant was at Time 2. However, at all five time periods, fathers reported higher arousal levels and they were all significant except at Time 5. There were minimal differences in cortisol levels between the parents' reports except at Time 4 when mothers reported higher levels than the fathers did. Although the tribulin levels for the parents were within the norms (Hucklebridge et al., 1998)., the mothers tended to report higher levels than the fathers did. Both mothers and fathers reported the appearance and behaviours of the infants and the delay in performing their parental role as the most potent of the stressors of SCN experience.

7.44 Mothers and fathers of term infants

Mothers of term infants did not report more stress than the fathers at each of the three time periods. However, it is interesting to note that fathers had higher arousal levels than the mothers at each of the three time periods. This group of parents had a more satisfactory relationship at the birth of their infant but it had deteriorated by 16 weeks after the infants were discharged from the hospital.

The next chapter provides detailed discussion of the results of the study.

Chapter 8 **Discussion of results** **Page**

Chapter 8

Discussion of results

8. **Introduction**

The main finding of this study showed that parents of preterm infants were understandably stressed within the few days of the birth of the infants, but stress levels had decreased by 16 weeks after the infants were discharged home. However, the self-reports of stress did not correlate with the parents' cortisol and tribulin levels which were lower in the parents of preterm than in parents of term infants. There were gender differences in the stress reports between the mothers and fathers of both groups. Mothers tended to report more stress than the fathers and this has also been referred to by Thoit (1991). The parents in the two groups coped by using both problem-and emotion solving strategies to deal with their stressful situations. There were positive correlations between low stress and a high number of perceived supports and satisfaction with the perceived supports. The predictors of stress in both parents of preterm and term infants emanated predominantly from psychological and psychosocial variables.

There were six hypotheses tested in this study:

1) Parents of premature infants in the SCN will report higher levels of stress (e.g. negative emotions of anxiety, anger, depression) compared to parents of healthy term infants.

2) There are gender differences in the perception and experiences of stress between mothers and fathers of premature infants.

3) There is a positive relationship between self-reported stress and levels of the biochemical markers of cortisol and tribulin.

4) Parents will use both problem-and emotion-solving coping strategies to deal with the stressful events of birth and the outcome for the infants (admission or non-admission to SCN).

5) The high scores of psychological and psychosocial variables, high levels of biochemical markers of stress, and demographic profiles of the infants and parents will predict the stress of parents.

6) The availability of high social support will buffer the impact of stress on parents of preterm and term infants.

8.1 **Hypothesis One:- Parents of premature infants in the SCN will report higher levels of stress compared to parents of healthy term infants.**

It is clear that each parent reacted differently to the birth of their infant and this has also been reported elsewhere (e.g. White et al., 1999; Bradburn and Kaplan, 1993). A comparison of stress reports between the mothers of term infants and mothers whose preterm infants had been admitted to SCN, reported increased stress in the latter within the first few days of the infant's admission, and the difference in stress reports between the two groups were statistically significant. By one week after the premature infant's discharge from the hospital, the mothers continued to report feeling stressed but to a lesser degree. However, at 16 weeks after the infants had been discharged from the hospital, there were no differences in the reported stress between the two groups. This may be due to the fact that these mothers of preterm infants seemed to have gone beyond their initial shock and were adjusting to the realities of caring for their infants at home. Because the preterm infants were in hospital longer than the term infants, these mothers had the opportunity through mothercraft classes to increase their parenting skills (e.g. making up feeds, sterilising of milk bottles, and bathing the baby) and thus increased their self-confidence in knowing how to care for their infant. In contrast, the mothers of term infants who were hospitalised for shorter periods did not have the opportunity of attending the "mothercraft" classes organised by the nurses or to have received one-to-one demonstrations of caregiving activities (e.g. making up feeds) that are typically provided for mothers in frequent attendance at the hospital. In addition, parents of term infants may probably still be adjusting to the overwhelming process of becoming a mother and the fact that child care involved more work than they had anticipated. It can be speculated that they may have experienced the reality of early motherhood was different from their expectations.

However, mothers who had the experience of caring for a child may be less likely to be overwhelmed by motherhood compared to first time mothers. In this study because of the huge differences in the number of primigravida and multigravida in both groups no analysis was performed. In the mothers of preterm infants there were 46 primigravida and 14 multigravida and in the mothers of term group there were 44 primigravida and 16 multigravida. Brooten and colleagues' (1988) study of mothers with premature infants in NICU found that maternal anxiety, depression, and hostility, while initially high, reduced over time by 9 months after discharge. Trause and Kramer (1983) also found less distress in mothers of preterm infants at 1 and 7 months after the infants' discharge from the hospital than in the week following the infants' birth.

The findings that mothers reported stress following the premature birth is understandable and consistent with that of other studies (Pederson et al., 1987; Padden and Glenn, 1997; Redshaw, 1997). However, in this present study, the infants were in a special care nursery and were not considered to be medically ill to any serious or concerning level. There is evidence (Pederson et al., 1987; Padden and Glenn, 1997) that mothers of preterm infants admitted to the neonatal intensive care nursery, even though not considered to be critically ill, experienced a range of emotions and reactions not dissimilar to those described by mothers of critically ill infants. Thus, it appears that the admission to a nursery/unit providing special care engenders heightened concern reactions rather more than whether the infant was actually seriously ill or not. This leads to considerations of the impact of the NICU/SCN environment as a stress provoking encounter, as indicated by Miles (1987) and measured on the PSS:NICU Scale (Miles, 1987).

Compared to fathers of term infants, fathers whose preterm infants were admitted to a special care nursery, also showed increased self-reported stress within the first few days of the child's birth, and the difference between the father groups was statistically significant. The fathers of preterm infants remained slightly stressed at 1 week after discharge (Time 4) but less stressed at 16 weeks after discharge (Time 5) of the infant from the hospital. This may be due to the fact that after the initial shock of the unexpected early birth, the fathers may have adjusted to the fact, as although the infants were born premature, they were otherwise healthy. That the fathers of term infants were more stressed at Time 5 may be due to their deteriorating relationship quality with their partner as shown in their DAS scores (p. 198) which were greatly reduced at Time 5.

When considering the stress caused by the birth of a preterm infant, it is useful to consider the impact of a normal birth on a family for comparison. There is reported evidence that the birth of any child, whether preterm or not, produces a certain amount of stress for the new parents (Beckwith and Cohen, 1978; Cowan et al., 1991). Hobbs (1968) studied the “transition to parenthood” and reported that many of the parents experienced varying amounts of stress following the birth. The sources of stress emanated from pervasive tiredness, disruption in daily routines and economic strain.

In 1994, the Victorian Department of Human Services (DHS) commenced a state wide Hospital in the Home (HITH) programme which substituted the acute care traditionally provided in the hospitals, for care provided in people’s homes. This initiative has been successful for a range of conditions and treatments, and the DHS continues to provide incentive funding to hospitals which have implemented the HITH programme. In 1995, the Mercy Hospital for Women, where this study was carried out during December 1997 to June 2000 implemented the HITH programme for the early transfer of infants, who required only intranasal oxygen. The HITH-nurse provided follow-up visits at their homes. In 1999, the hospital reviewed the programme and found that families were satisfied with the services provided. The programme was then extended to include other infants requiring a wider range of care (intravenous antibiotics, monitoring of breast feeding and weight gain with the occasional gavage (tube) feeding, palliative care for severe brain injured infants who were unable to suck and those requiring long term feeding via the gavage tube, and care following closure of ileostomy, a complication of necrotising enterocolitis). This programme included 12 infants recruited in this present study who were transferred into the HITH programme. Initially, concern was experienced that a new management option was made available after the start of the study when recruitment was underway. Some mothers of these infants completed the questionnaires, but unfortunately collection of the salivary samples was carried out in the morning rather than at the specified times of 4-8 pm, so these samples were not included in the final analysis, resulting in only 4 remaining in the study for analysis.

Because of these small numbers from the HITH programme, no comparisons of stress levels were made with mothers of infants not transferred to the HITH programme nor with the mothers of term infants. However in comparing their levels of state-anxiety, these mothers reported slightly higher anxiety levels at Time 4 (M 19.75, sd 4.27) and slightly higher self-reported stress (M 39.50, sd 10.47) although they were not statistically significant. Lower levels at Time 5 were found in anxiety (M 15.25, sd 3.86), and stress scores (M 27.25, sd 4.03) compared to the normed values. At one week after discharge from the HITH programme (Time 4) these mothers reported that they were feeling stressed. This finding indicated that being discharged early to their home environment even though assisted with home visits from the HITH nurse, did not reduce their stress levels. However, because of the very small sample size, this finding has to be interpreted with caution. This could provide a basis for further research in the future. A search of the literature revealed only one study (Swanson and Naber, 1997) where NICU nurses provided follow-up care for neonates who required partial nasogastric feed, or for other neonates with bronchopulmonary dysplasia who required continuous oxygen therapy in the home environment. It was found that a reduction in NICU length of stay was the case and lower rates of readmission were needed for this population. A further search of the literature did not reveal any reported studies of this different management programme (HITH) and its effects on the parent's stress levels and clearly indicates a need for more research.

In this study, the parents of preterm infants did not have the added stress of being a single parent. They were either married or in a stable defacto relationship. They were from a middle-class socioeconomic background, well educated with over 50% having received college education and were mostly in professional occupations. The Mercy Hospital for Women is one of three tertiary hospitals in Melbourne caring for high-risk perinatal patients transferred from Level I and Level II hospitals from across the whole of the State of Victoria. Thus, it is reasonable to say that the population would be representative of the other two tertiary hospitals. The infants in this study were healthy and the parents were able to hold their infants within the first week of the infant's admission to SCN. The average length of stay in the hospital was 29 days (range 9 - 46) compared to an average length of stay of about 40-45 days for low birth weight infants who had been admitted to NICU, where they either stay at the same hospital until discharge home, or until transfer to a Level II hospital for continuing care (e.g. Royal Women's Hospital, Melbourne, 2000). Thus, these parents were not burdened by such added stresses of their infants being medically ill, undergoing prolonged separation and not having their spouse support available.

8.2 **Hypothesis Two:- There are gender differences in the perception and experiences of stress between mothers and fathers of premature infants.**

The surprising finding of this study showed that only at Time 2 there was a statistically difference in the stress between the mothers and fathers of the preterm infants. However, mothers had reported higher stress levels within the first week of the premature birth, just before discharge home and at one week after discharge home. Stress reports changed by 16 weeks to reveal the mothers returning lower levels than the fathers after the infant's discharge home. An explanation for these differences in self-reported stress levels may be due to the different parental roles under-taken. Mothers may have regarded the event of the premature birth as if it were a threat to her status, goals and objectives and therefore more threatening to her self-esteem than the fathers experienced. Jeffcoate and colleagues (1979b) similarly found that mothers of preterm infants compared to fathers of preterm infants experienced lower self-esteem and self-confidence, and this finding was proposed as due to their separation from their infants. Since it is the mother who gives birth to the child and expects to assume caregiving activities after birth, it is no surprise that it is the mother who suffers loss of self-esteem through failing to produce a infant who is born on time (i.e. full term). This may be one of the causes of their higher stress levels in the first week after the birth of their premature infants. Once they accepted the event and became assured that their child had no physical or neurodevelopmental delay, their stress levels were reduced. It may also be due to the confidence and trust in the expertise of staff working with their child. This was demonstrated by Time 5, 16 weeks after discharge of the infant from the hospital. Another explanation is the differing parental role expectations of mothers and fathers. Mothers tend to see themselves in “caring” and “nurturing” roles, whilst the fathers tend to see themselves as “protector” “provider” of the family (Jeffcoate et al., 1979b).

The greatest sources of stress for the parents whose premature infants were admitted to a special care nursery appeared to emanate from two sources:(i) the appearance and behaviours of the infant, and (ii) the delay in being able to perform the normal parental care giving activities. These results were supported by the earlier findings of Miles (1989) regarding the stressors of parents with premature infants admitted to a neonatal intensive care unit. Miles proposed that preparatory interventions with parents whose infants are admitted to NICU/SCN should include the provision of prior information on the physical appearance and behaviours of premature infants to be expected, both of their own and others' babies. Another recommended aspect is to encourage the parents to participate in the care of the infants as far as possible, such as changing the nappy, holding the feeding tube during feeding time and being allowed to hold their infants when feasible or to touch and stroke them. In these ways, the mother can start to experience her infant as needing her help and care and she can become desensitised to the small infant's atypical appearance.

The mothers did not find any difference between the stressors of SCN at Time 1 and Time 2, while the fathers found that at Time 1 the sights and sounds of the SCN environment were quite stressful, followed by difficulties experienced in communicating with the staff. At Time 2 however, the style of staff communication and staff-parent relationships were reported to be greater sources of stress than the sights and sounds of the nursery environment for the fathers. This may be due to the fact that the fathers were used to the physical environment of the nursery but not to the number of different nurses caring for their infants across different shifts. During their infant's hospitalisation period, mothers visited the infants more, compared to the fathers, and therefore the mothers had the opportunity to meet and interact with more nurses than the fathers did.

For the present study, at Time 1, the sights and sounds of the nursery provided most disturbance and the greatest source of stressors was from the sudden noises of monitor alarms. While both parents reported these monitor alarms as stressful, 68% fathers found it stressful compared to 82% mothers indicating that more mothers were affected by this stressor. Regarding the infant's appearance and behaviours, the parents indicated the presence of monitoring equipment on/near the baby as stress provoking, although fewer fathers (50%) were affected by this compared to 67% mothers. It is not surprising that both parents indicated that being separated from their babies was stressful, with nearly all mothers (95%) reporting greater stress by being separated from their infants than the fathers were (72%). While at Time 1 parents did not report the staff behaviours and communication style as particularly stressful, they indicated that they were stressed by not being told of the tests and treatments being done to their baby. This may suggest that the parents want to be involved in the decisions being taken for the management of the baby's care, or that more information about the various procedures informs them and assists the parents to feel in control through knowing and understanding what was being done. Being "kept in the dark" heightens anxieties resulting in stress through a sense of exclusion and enforced helplessness.

It is surprising that even though the physical structure and appearance of the special care nursery is less daunting than the neonatal intensive care unit, most parents found the physical aspects of the nursery stressful. This is probably because this special care nursery is located in a tertiary hospital centre and capable of caring for very small and sick babies. Overall, mothers more than fathers found the SCN experience more stressful at both Time 1 and Time 2.

8.3 **Hypothesis Three:- There is a positive relationship between self-reported stress and levels of the biochemical markers of cortisol and tribulin.**

A unique feature of this study was the design which included the collection of both subjective and objective measures of stress concurrently. Self-reports of emotional states alone have to be interpreted with caution because they can be unreliable if the subjects do not wish to express their stress. In attempts to provide a more definitive picture of stress experiences this study included the collection of salivary samples for biochemical markers of stress assays as reliable method of assessing the degree to which the parents of both preterm and term infants were stressed. Overall parents of preterm infants reported higher stress levels than the parents of term infants and interestingly their cortisol and tribulin levels were lower than in the parents of term infants. When compared to the norms of cortisol levels (M 3.9 ± SEM 0.2; range 2.2 - 4.2 nmol/L, Orth et al., 1992; Laudat, 1988), cortisol levels at Time 1 (M 4.14 nmol/L) of mothers of preterm infants were at the higher level of the published norms; at Time 4 (M 5.94 nmol/L) cortisol levels were above the norms; and at Time 5 (M 4.19 nmol/L) the levels had returned to the higher stratum of the norms. For the fathers of preterm infants at Time 1 (M 4.63 nmol/L) the levels were slightly higher than the norms; at Time 4 (M 4.26 nmol/L) the levels were reduced to the higher level of the norms; and at Time 5 (M 4.43 nmol/L) the levels increased to slightly above the norms. It is interesting to note that even though parents of term infants reported less subjective stress compared to parents of preterm infants, their cortisol and tribulin levels were higher. When compared to the published norms of cortisol, mothers of term infants at Time 1 had levels (M 8.76 nmol/L), double that of the norms; at Time 4 (M 7.25 nmol/L), the levels remained very high; and at Time 5 (M 3.97 nmol/L), scores had reduced to the higher level of the norms. For the fathers of term infants at Time 1 (M 5.30 nmol/L), the levels were higher than the norms; at Time 4 (M 5.30 nmol/L), the levels remained high and unchanged; and at Time 5 (M 4.71 nmol/L), the levels reduced but still were higher than the norms.

These findings in the parents of preterm infants did not support the findings of other studies which showed increased cortisol and tribulin production in stressful situations (Eriksson et al., 1999; Kahn et al., 1988; Clow et al., 1997). An explanation for the cortisol and tribulin values of the parents of preterm infants being lower than that of the parents of term infants may be that they were coping better with the stress. Levine and colleagues (1978) have argued that when an individual is coping with stress, there is little or no increase in plasma cortisol. In hindsight concurrent assessment of noradrenaline and adrenaline might have provided a clearer picture. Frankenhaeuser (1983) found that both catecholamines and cortisol were elevated in subjects in a low control situation, but only cortisol which reflects feelings of distress, decreased relative to baseline in subjects in a high control situation. Thus, in this study, the parents of the preterm infants were in a low control situation but the responsibility for their infants had been removed and taken over by the medical and nursing staff "Powerful Others" (see Wallston and Wallston, 1978). In the study by Perehudoff (1990) on parents' perceptions of environmental stressors in the SCN, one of the fathers wrote "Contrary to being stressful, I found having my baby in the unit to be comforting. Given his age and condition, there is nowhere that I would prefer that he be (p. 42)." The father felt reassured seeing his infant in the care of the "Powerful Others".

8.4 **Hypothesis Four:- Parents will use both problem-and emotion solving coping strategies to deal with a stressful event.**

The coping strategies of the parents were assessed using the Ways of Coping Checklist developed by Aldwin and colleagues (1980) based on

Lazarus' model of stress and coping, subsequently revised by Vitaliano and colleagues (1985). The parents of both groups of infants coped using both problem- and emotion solving strategies. At Time 1, 34 (28%) of the mothers in both groups identified social support as the most important coping strategy. They sought support from their spouse, family and friends. Thirty (25%) sought to find meaning of the event through positive reappraisal. Twenty-two of the mothers (18%) utilised escape-avoidance, for example carrying on their usual activities as if nothing had happened, or feeling better by eating a lot as 'comfort-seeking'/ emotion management. At Time 5, seeking social support was less important, as the number reporting this had reduced to 23 (24%), finding meaning to the event to 21 (22%), and 13 (13%) used escape-avoidance. Other coping strategies had also been used, such as self-control by 9 (9%) and finding solutions to the event (planful problem solving) by a further 8 (8%), to cope with their stressful situations. A few mothers used prayer as a coping strategy.

For the fathers of preterm and term infants, there were also differences at both Time 1 and Time 5 in the number of fathers using different coping strategies. Thirty-six of the fathers (30%) compared to 21 (22%) sought to find meaning to the stressful event (positive reappraisal), 25 (21%) compared to 18 (19%) sought social support from spouse, family, and friends, followed by 17 (14%) to 14 (14%) using escape-avoidance to cope with their stressful events. A few fathers used religious coping through prayer.

This study supported the findings of Affleck and colleagues (1991) that mothers used strategies that involved seeking social support and finding meaning to the event, and also used more avoidance coping than the fathers. The avoidance coping strategy included carrying on as if nothing had happened and feeling better by eating more (comfort bingeing).

8.5 Hypothesis Five:- The high scores of psychological and psycho-social variables, high levels of biochemical markers of stress, and demographic profiles of the infants and parents will predict the stress of parents.

It is interesting to find that gestation predicted the the stress of the mothers of preterm infants at Time 1. This did not support the finding of Thompson and colleagues (1993) which found that the distress of the mothers at the time of premature birth was not a function of the child's gestational age. However Meyer and colleagues (1995) found that mothers whose premature infants required ventilatory support because of their prematurity reported greater distress related to the NICU hospitalisation. They also found that younger mothers (age < 18 years) experienced more distress than older mothers of premature infants. This may be due to inexperience and limited coping ability in younger mothers due to their lack of life experiences of negative events. In addition, younger mothers generally have fewer instrumental resources to access (e.g. money, transportation to the hospital) and possibly fewer sources for emotional support. The parents in this study were aged between 20-40 years and they were not highly stressed except in the first week of the infant‘s admission to SCN. It is not surprising that in this study the predictors of stress for parents of both preterm and term infants were the psychological variables of anxiety, anger, arousal, trait-anxiety and trait-anger indicating that a predisposition (trait) to negative emotions rendered some people especially vulnerable to high stress reports. Other predictors included psychosocial variables such as poor relationship quality, insufficient number of perceived social supports and related low satisfaction with these perceived supports.

8.6 **Hypothesis Six:- The availability of high social support will buffer the impact of stress on parents.**

The buffering theory of social support (Cohen and Mckay, 1984) hypothesises that stress from psychosocial sources will have deleterious effects on the health and well-being of those with little or no social support, while for those with stronger support systems, these effects will be reduced or eliminated. In the buffering theory, the availability of support may play a role at two different points. First, support may intervene between the stressful event and the individual’s stress reaction (anxiety, anger, depression) by attenuating or preventing a stress appraisal response. For example, the perception that others will provide necessary resources enables the individual to assess a situation differently and prevent it from being appraised as overly stressful. Second, adequate support may intervene between the individual's experience of stress and the onset of ill-health. At Time 1, the mothers of preterm infants had higher depression scores M 2.59 vs M 1.93 (Short Form of the Beck Depression Scale) indicating that they were more depressed than mothers of term infants but there were no significant differences between the two groups at Time 4. In this study, at Time 1 the mothers of term infants reported having a better relationship quality measured by the global item from the DAS with their partner than mothers of preterm infants.

The general relationship between marital status and health has been well documented and is an important aspect of social support (Ensel, 1986; Menaghan and Lieberman, 1986). Married individuals tend to report less psychological distress in stressful events than the unmarried and the married/stable cohabiting couples also have lower rates of utilisation of health care facilities for example admission to hospital (Riessman and Gerstel, 1985). Two explanations have been suggested for this positive correlation between married/committed relationship status and health. First, marriage affords opportunity for confiding and intimate interactions which provide the partners with frequent psychic comfort and support

(Kessler and Essex, 1982). Second, marriage allows the pooling of emotional and practical resources of the two partners (Lin and Westcott, 2000). There are many studies attesting to the fact that married individuals overwhelmingly name their spouse as their confidant (Lin et al., 1986). Levitt and colleagues (1986) and Coffman and colleagues (1990) found that support from the husband was significantly related to life satisfaction and emotional affect in wives and mothers.

In the present study, it was apparent that the parents of preterm infants were not highly stressed according to the self-reports and also as indicated by biochemical indices. However, this low reactivity may be caused by other factors including the socioeconomic background of the parents. These participants were from a middle-class background, well educated with over 50% having received college education and most were in professional occupations. Studies have shown that high socio-economic status correlates with low negative affects (Gallo and Matthews, 1999; Sykes et al., 1999; Doering et al., 2000). The healthy status of the infants though premature in gestation, also contributed to the low stress as the infants were not medically ill and were hospitalised mostly for cautious observations. Thus, from this study it is difficult to conclude that social support buffers the impact of stress because there were other contributing factors as to why the parents of preterm infants experienced lowered levels of measured stress. From this study one has to interpret with caution whether social support buffered the impact of stress. Further studies are required to test this hypothesis more thoroughly.

8.7 **Summary**

In this study, parents of preterm infants reported higher stress only during the first week of the infant's admission to SCN but had lower biochemical markers of stress (cortisol and tribulin) than parents of term infants. This may be attributed to several factors. First, parents of preterm infants may be coping well because of their supportive personal network and hospital services. Secondly, the parents were from a middle-class socioeconomic background, well educated and were mostly in professional occupations. Thirdly, the infants were not medically ill and they were in SCN for tube feeding and observation.

For parents of preterm infants, mothers reported higher stress than the fathers and this may be due to the differential impacts in changes to understanding parental roles. Even though both mothers and fathers experienced similar stressors in the SCN, more mothers than the fathers were affected by both the appearance and behaviours of their infants coupled with the delay in being able to engage in expected caregiving activities.

In the parents of term infants, mothers did not report more stress than the fathers at Times 1 and 4, but at Time 5, the fathers reported more stress than the mothers. This may be due to their deterioration in their relationship with their partner. This was shown in their DAS score. However, over all, the fathers had higher arousal levels than the mothers at Times 1 and Time 4.

Chapter 9 Follow-up interview **Page**

Chapter 9

Follow-up interview

9. **Telephone interview**

When all the premature infants had their first birthday, a follow-up interview was carried out to determine the impact of the premature birth on the long term outcomes of the family. All parents of preterm infants who had completed the questionnaire at 16 weeks after discharge home (Time 5) were contacted by telephone. Since it was not part of the initial study protocol, only parents that could be contacted were interviewed. Forty-two sets of parents of preterm infants had completed the final questionnaire and of these, 16 mothers and 4 fathers were interviewed. Of the remaining parents, 7 couples had moved to a new location, 14 couples were unavailable even though several telephone calls were made and of the remaining 5 couples the telephone lines were disconnected. At the time of the follow-up, the age of the youngest child was 1 year 1 month, the oldest child was 3 years 5 months and the median age of the group was 2 years 4 months. The parents were told that the purpose of the interview was to find out how they were doing and that their participation was entirely voluntary. The mothers and fathers were interviewed separately and the discussion varied from 5 to 15 minutes depending on how much information the parents were prepared to provide. Permission to tape the interview was obtained verbally from the parents.

9.1 **Issues of concern**

The questions addressed the following issues:

1) Concerns on discharge of the infant to the family home
2) Services provided by the hospital
3) Becoming parents\Impact of life changes
4) Coping strategies used during the hospitalisation and home environment
5) Sources of social support

9.11 Concerns on discharge of the infant to the family home

From the responses two major themes were identified:

i) Problems related with remembering/recalling the event.

Some parents had difficulties recalling or remembering details of the event.

Typical responses were:

"……it's so long ago " (Mother)

" Oh God…it might..might take me a while to think……..." (Mother)

" I struggled to really remember exactly how I felt at the time… " (Mother)

There are two common explanations. Clearly, we remember less with the passage of time because the memory has just faded away. This is the most obvious explanation of forgetting and it fits well with our experience that what happened long ago tends to be harder to recall. The other explanation is the Freudian defence mechanism of repression (Freud, 1938) which explains retrieval failure by blocking the memory retrieval process of threatening or painful events (such as the birth of a premature infant) which was unconsciously expelled from the parents' consciousness because of its anxiety-provoking nature. The parents have difficulty accessing this memory possibly because of the defensive barriers that had been erected to prevent the stressful memories becoming conscious.

ii) Well being of the infants.

When any newborn infant is ready to be discharged from the hospital, it is often a time for which the parents have waited with anticipation. However, for many new parents the discharge home is also accompanied by feelings of fear, anxiety, and worry about being sufficiently able to cope especially with such a small, seemingly fragile/vulnerable infant. For parents of preterm infants the transition to home is a long-awaited and anticipated event. The fears and anxiety are related to the change from a controlled supervised environment of SCN to an uncontrolled, unsupervised home environment with no expert professionals in ready access if any unexpected developments were to occur.

In this follow-up interview, a majority of the parents (88%) were concerned over the general health and well being of their infants. This is a similar finding to parents taking a full term infant home (Pridham et al., 1982; Nyberg and Sternhufvud, 2000). There were others (22%) who were not so concerned because they believed that the infant's health and well being was assured if the child was allowed to be discharged from the hospital.

> *" ……her well being was good….. "* (Mother)
> *" …..that she would be OK……."* (Mother)
> *" …..new baby to bring home…….a little bit worry[sic] "* (Mother)
> *" …..just the usual….initial motherhood concern…."* (Mother)

Those parents who were concerned because the infants were born prematurely, may have had continuing special needs requiring a high level of expert care.

While a few others expressed no concern

> *" OK to take her home, she is healthy enough "* (Father)
> *" Actually none…no…doctor said that he was alright….that made it easier..there was nothing wrong with him "* (Mother)
> *" No worry at all……no…..because we know everything from God [sic]…"* (Father)

While some expressed concerns specific to a premature infant.

> *" ….grow and be a normal size baby "* (Mother)
> *" I don't know because she is so small that's all…… "* (mother)
> *" …..increased chance of her stopping breathing so that was something that was in my mind "* (Mother)
> *" He was still small and also the bonding because he was in the hospital for 6 weeks in the end……"* (Mother)

9.12 <u>Services provided by the hospital</u>

i) The parents were pleased with the services provided by the hospital.

There were similarities expressed by mothers of full term and preterm infants regarding the needs for information and support from spouse, family and health care professionals. These were centred on the infant's health, the baby's expected growth and development, feeding and sleeping patterns. There were also some differences between the needs expressed by parents of preterm and term infants. One of the major concerns for mothers of preterm infants was whether their infant would stop breathing.

" I was quite happy with all the services….the staff were great….. the nurses were great….." (Father)

"……quite happy…….staff/nurses were good ……" (Mother)

" A lot of help….special care nursery……a lot of things……how to look after him and all like that[sic] " (Mother)

"…..the assistance in the special care nursery was good in terms of attachment (breast feeding)….learning how to get attached…." (Mother)

" *……they gave me a bit of….a bit of confidence with him...bathing… looking after him…."* (Father)

A few others (n=4) had difficulties recalling or remembering.

" ….was quite good if I can remember……" (Mother)

" Gosh….so long ago now I am really struggling to remember the details……" (Mother)

" It was a long time ……forgot….. " (Mother)

ii) Desires for extra services

A majority (90%) of the parents required no extra services beyond what was provided .

" I got all the services that I required….no…I was really pleased with the care….." (Mother)

" No...I don't think I expected any more than what we got…no.." (Mother)

" No…that will be…no…I think the help from the hospital was enough" (Mother)

However, two mothers reported they needed extra help.

" ……may be a counsellor " (Mother)

" In the hospital……more practical (normal care giving activities such as feeding and bathing) things but I wasn't there very long… " (Mother)

9.13 Becoming a parent/Impact of life styles changes

i) The transition to parenthood is a time of significant life changes for a couple. Most parents reported disruptions to their usual routine, as they had to schedule their time around the infant and inevitably experienced a reduced amount of free time. In this follow-up interview, all parents expressed that their lives had been changed with the birth of the baby but also that the change was positive.

" She has certainly changed our lives ….she runs the household…….we live around her ……slows everything down but it's a pleasure " (Father)

" Totally changed my life..time..my time is more restricted now..scheduled around her " (Mother)

" Takes a bit of time that you have free..thinking about him " (Father)

"….centre of my life..trying for 4 years…she was so wanted…." (Mother)

One mother reported feeling a failure for not giving birth to a full term infant. This has been noted by other researchers (Jeffcoate et .al., 1979b; Boardman, 1995). There were 3 parents (2 mothers and 1 father) who felt that their child was slow in reaching the usual developmental milestones but they hoped that progress would be made over time.

(ii) Current perceptions of parenthood

Even though a majority of the parents expressed that their lives had been changed in some ways, they had positive views about it.

" I feel fantastic…..I feel good " (Mother)

"….really contented….really happy actually……" (Mother)

"….very happy..I am enjoying every moment that I have with her…" (Mother)

"….the prematurity…I kind of forget now…" (Mother)

However, one mother felt disadvantaged by the premature birth.

" ….I didn't get the big round belly… the kicking and all the wonderful things…"

While a few others still expressed concerns.

" I felt that she is a little bit short of what the other kids of her age…not as fit..not as big..and she is not as smart as them…I expect that to change in the next year or so " (Father)

" ….he was almost normal although he is still underaverage…a little below on the size..a litle bit slow..talking, eating.." (Mother)

" Nothing dramatic..but he is certaintly not a leader ..not advanced in a group " (Mother)

9.14 <u>Coping strategies</u>

According to Lazarus and Folkman (1984), coping is not a static process but a dynamic one that serves two major functions: (i) reduction of distress produced by the situation, termed emotion-focused coping, and

(ii) the management of the problem by thinking in preparation for action and/or physical activities causing the distress termed problem-focused coping. Both forms of coping are likely to be used during the course of a stressful event. In this follow-up, parents reported coping differently, some used problem-solving strategies (trying to find a solution to the problem), while others used emotion-solving strategies (talking to spouse and friend and relying on their religious faith).

Examples of problem-focused coping:

" Talked to people….talked to my friend that's how I coped..talked to my husband…" (Mother)

" ….coped by talking about it what ever the problem….talked to people…talked" (Mother)

to my husband, my family..talking about it…or trying to solve it, trying to rectify whatever the problem is " (Mother)

"……it depends really…I would….I would try to address the thing that is difficult and try and make a change for that thing….try to take stock of the situation…and try to really understand what the issue is….." (Mother)

Examples of religious coping that provided emotion control:

"…..just chatting with Rudy (husband*)…pray "*(Mother)

"……pray….just simple "(Father)

Example of emotion focused coping through distraction.

"….probably immerse myself in other things…" (Mother)

9.15 Sources of social support

The construct most often considered to be one of the major determinants of successful parenting is the quality of the marital\partner relationship. Belsky and Vondra (1989) claimed that the marital relationship is the principal support system for parents and spouse support has a direct effect on parenting. A supportive spouse is likely to provide advice to his or her partner, showing emotional empathy, sharing of joys and fears, conjoint interest in and commitment to their daily life, their child(ren) and carrying out practical tasks and assistance. Overwhelmingly, the parents in this interview named their spouse as the most important person providing the support.

> *"My wife is the most important supportive person at the moment…."* (Father)
> *"My husband…by being there..doing things..being part of everything….he shared the things and that's the most supportive thing…"* (Mother)
> *"My husband…helps me with the kids…does things for me…doing house-work..just being there is a lot of help when I need him and that…"* (Mother)
> *"Nessia (wife) she is good..helped me a lot..taught me how to change a nappy..take care of Stephanie "* (Father)
> *" My husband without a doubt…absolutely my husband….."* (Mother)

It is interesting to note that out of the 16 mothers, 6 mothers had become pregnant again or given birth to a second child. This outcome supports the finding of Trause and Kramer (1983) who found that by 26 months, nearly 50% (9) out of 19 mothers of preterm infants had become pregnant or given birth a second time. These parents had also previously given birth to preterm infants who were relatively low-risk (mean birth weight 1900 $\pm$ 435; gestational age of 33.7 $\pm$ 2; average length of hospitalisation of 24 $\pm$ 15 days; all infants were taken off the respirator by 7 days). However, the present study did not support the finding of

Stjernqvist (1996) who studied the impact of the birth of extremely low birth weight (ELBW) infants on the family after 1 year and 4 years later. She found that out of the 20 mothers of ELBW infants, at 1 year, 6 (30%) mothers did not want to give birth again and at 4 years none of these 6 mothers had another baby and an additional 4 mothers had undergone sterilisation. All the premature infants of these mothers had some form of neuro-developmental delay. It would appear from this report that the birth of an ELBW infant had been a significantly traumatic experience for these mothers.

9.2 **Issues arising from the qualitative follow-up**

Most parents recalled feeling little concern about taking their premature infant home because of their trust and confidence in the medical staff at the hospital (Power Others). This has been described by Wallston and Wallston (1978) as a potent source of comfort in stressful events. They were, however, very concerned about the general well being of the infant and the parents believed that because the infants had been born prematurely, they were likely to require special care.

Most parents were satisfied with the services provided by the hospital and did not require extra services. Davis and colleagues (1996) who interviewed 37 mothers with infants hospitalised in a NICU, reported that the mothers found that instrumental, emotional and comparison support (encouragement, advice, and information given by someone in the same or similar situation) were more important than they had anticipated prior to taking their infants home from the hospital. In addition, the mothers reported receiving less assistance than they had expected of all types of support except comparison support, that is the advice and information received from the other parents of premature infants who had gone through similar experiences. It is possible that the different findings between this study and the present study is that the infants in the Davis et al’s (1996) study were admitted to NICU and that they were more ill than those in the present study.

Of the 16 mothers who were interviewed, two mothers felt that they needed extra assistance while their infants were in the hospital. One mother who was depressed felt that she needed to talk to a counsellor. Parents whose infants are hospitalised in a special care nursery/ neonatal intensive care nursery should be advised that there are additional services in the hospital available to help them work through their emotional or social problems. The other mother of the two, reported that she would have liked more information while she was in the hospital on how to care for her infant. The infant had been transferred to the Hospital in the Home (HITH) programme and it is clear that this mother did not understand the purpose of the programme and her lack of awareness contributed to her confusion, misgivings and anxieties.

All parents reported that their lives had been changed in some ways by the birth of an infant though premature which is no different from the early perceptions of any parent of a new baby. Most of them commented that their free time was reduced, and they had to schedule their lives around the child. These reports are also common among many parents of term infants. However, except for one mother, they still felt positive about their experiences of having the child. Some parents were, at one to two years later, still concerned that their child was neuro-developmentally delayed (e.g. slow in eating, talking) compared to a child born at full term but they maintained hopes that their child would reach the usual milestones over time.

Coping with a stressful event is an individual process, which differs from person to person and people differ in how much support they want or seek during stressful events. In this follow-up interview, the parents had coped using both problem-and emotion-solving strategies. All parents (both mothers and fathers) reported that their spouse was the most important support person (e.g. Affleck et al., 1991; McKim, 1993; Trause and Kramer, 1983). Affleck and colleagues (1991) found that the mothers praised the support that they had obtained from their husbands, and most mothers named their husband as the person who gave them the greatest help and comfort. McKim (1993) surveyed 56 mothers of high-risk premature infants and found the main support for these mothers had been their husband/partner and a secondary source of support was the mother's own mother. Trause and Kramer (1983), who studied the effects of premature birth on parents and their interpersonal relationships, found that the support of their husband helped in their adjustment to having their infants at home. The more aware the father was to the mother's needs and feelings, the less difficulty the mother experienced of having the infant at home in her/their total care. There were also some reports of religious coping, for example use of prayers and praying (Bass, 1991; Hughes et al., 1994).

9.3 **Summary**

At the follow-up interview, parents expressed that they had no concern about taking their preterm infant home because the doctor's discharge assessment stated that the infants were healthy enough to discontinue specialised care. There were a few mothers who expressed concerns specifically to having a premature infant. Two mothers and one father reported that their child was developmentally delayed. These parents commented on the small size of their child, the delays in talking and the child not being as smart as children born at full term. Other studies (Aylward et al., 1989) have also noted these findings. However, these parents remained hopeful that their child would reach the usual milestones over time. Except for two mothers, all the mothers and fathers interviewed were satisfied with the services provided by the hospital.

Changes to their life styles were also reported but they held positive views of the outcome.

The parents reported using both problem-and emotion coping strategies to deal with their stressful situation. Overwhelmingly the parents reported that their spouse was the most important person providing them with the support. Secondly, knowing that their infant was having the best care in the SCN can be speculated as probably contributing to their low stress. This was supported by the comments obtained from the follow-up interviews. The parents reported that they were reassured that their infants were in SCN and that they were pleased with the services provided by the SCN. Thirdly, individuals who put their trust in *Powerful Others* probably experienced less stress. Wallston and Wallston (1978) adapted Rotter's Internal-External Locus of control theory to include *Powerful Others* as a powerful option in stress management strategies.. In effect, this included the notion of putting their trust in the hand of someone else as more knowledgeable or in control, e.g. the health professional team, as a mediating factor in stressful life events. Thus, parents of preterm infants who have high trust in the knowledge and expertise of the doctors and nurses caring for their infants, would be expected to experience reduced stress. In this interview, one mother and one father expressed no concern because the doctor commented that their baby was fine.

The next chapter discusses the limitations/weaknesses of the study.

Chapter 10 Limitations/Weaknesses of the study **Page**

Chapter 10

Limitations/Weaknesses of the study

10. **Method and attrition**

Recruitment and retention of an adequate number of subjects are crucial to the success of any study and the most serious problem of a longitudinal design is attrition of subjects or loss of subjects at different points of the study. In this study, Time 3 had the lowest number of subjects and this is mainly due to the early discharge of the infants from the hospital. As the infants who were recruited into this study were not all booked for delivery at the tertiary level maternity hospital, once their conditions were stable, they were transferred back to the referral hospital which could have been up to 200 kilometres from Melbourne. So there were difficulties following up these infants. There was some attrition at other times in the study also even though several telephone calls were made when the parents had not returned the questionnaires.

The qualitative reports of the follow-up results should be interpreted with caution especially given that respondents were expected to recall events that had occurred up to two years before. This delay has the disadvantage that information may have been forgotten or may be recalled inaccurately or selectively. In this follow-up interview, some parents reported distinct difficulties in recalling or remembering the details of the event. One explanation is the application of the defence mechanism of repression (Freud, 1938) which explains memory retrieval failure because of the blocking of the memory retrieval process of threatening or painful events which have been unconsciously expelled from consciousness because of their anxiety-provoking nature. The parents cannot access this memory because of the defensive barriers that have been erected to prevent it becoming conscious.

Obtaining salivary specimens at one point in time and not repeatedly over time on a specific day only provides spot measurements. To obtain measurements over time per day were not practical in this study, and therefore one needs to balance what is ideal and what is practical. Another limitation of the present study occurred when some parents collected their salivary specimens in the morning when the levels were high due to the usual circadian rhythms instead of in the late afternoon after 4 pm as instructed, when it was hypothesised that higher than normal levels would occur in those parents who were stressed. As well, many samples were not sufficient in quantity for analysis of both cortisol and tribulin. This emanated from inadequate attention being paid by the participants to the instructions to suck on the cotton roll for at least 10 minutes during the time taken to complete the questionnaire in order to obtain a fully stimulated saliva flow. This was clearly not done by some of the parents.

10.1 **Measures**

In hindsight, the self-report questionnaires should have included a measure of locus of control and the multidimensional health locus of control instrument (MHLC) (Wallston and Wallston, 1978) would have been the measure of choice. Locus of control is a personality trait that is related to general psychological wellbeing and independent of the impact of life events (Rotter, 1966). An external locus of control (E-LOC) refers to beliefs that outcomes to demands are unrelated to one's behaviours, while an internal locus of control (I-LOC) refers to beliefs that the control of life experiences depends on one's own efforts to effect change. Since high internal people believe that they can determine their own fate and effect control, it is reasonable to say that these people would seek to be in control of their situation and therefore would be less anxious when facing a potentially stressful situation like having a baby and one that is premature requiring hospitalisation. An internally controlled individual is likely to engage in coping strategies that will moderate the impact of potentially stressful experiences. Thus, it is reasonable to expect an internally controlled person experiencing the birth of a premature infant would be less affected on measures of negative moods (anxiety, and/or depression). Alternatively, people who seek/desire control in situations that are uncontrollable (e.g. following admission of their preterm infant to a special care nursery) would be more likely to experience stress. It is obvious that locus of control does play some role in affecting the ways in which people cope with their experience. In this study, the parents of the preterm infants felt assured that their infants were in SCN, being cared for by the medical and nursing staff (Powerful Others) at Time 1, yet their negative moods were significantly higher than the parents of term infants. At the initial planning of the study the stressful life event measure was discussed. It was decided not to include the measure so as not to over-load the parents with questionnaire. In hindsight it should have been included in the self-report questionnaires.

The sympathetic adreno-medullary system is very responsive to a variety of conditions that involve change, resulting in an increased production of catecholamines. Also, unpredictable and/or uncontrollable events have been shown to result in increased catecholamines (adrenaline and noradrenaline) production (Frankenhaeuser, 1975). If control is achieved, adrenaline levels decrease near to normal but noradrenaline remains slightly elevated as long as attention demands prevail. Any state of under-stimulation or over-stimulation will be characterised by raised catecholamines output that corresponds closely to the subject's reports of feelings of discomfort or unpleasantness. Therefore, in hindsight it would have been valuable to measure catecholamines as well as cortisol and to have mapped the changes over time. Alternate advice was received during the planning stage of this study that tribulin was a suitable alternative biochemical marker (Norman, T, personal communication, 1997) as an indicator of HPAC activity of monoamine oxidase inhibitors, a key marker of anxiety. Given the results of the study this might appear to have been a less suitable decision. This is because tribulin levels rise in situations of acute stress in general and does not differentiate particularly how the individual is responding to the situation over time. In harm/loss situation, it is expected there would be high levels of cortisol, adrenaline and noradrenaline output especially in the presence of helplessness. Alternately, in a challenge situation, the noradrenaline will be moderately high but the cortisol and adrenaline levels will be very high (Frankenhaeuser et al., 1971; Lundberg and Frankenhaeuser, 1980).

10.2 **Future research**

From the literature search, this is the first study of its kind exploring these issues using a prospective controlled comparative group design. Future research should replicate this study in different SCN settings and in particular, these should preferably include objective measurements of both catecholamines and subjective reports of Locus of Control and stressful life event. Most of the parents in this study were caucasian, from middle class socio-economic backgrounds, well-educated and with supportive networks. Further investigations are needed to assess the possible effects of ethnicity, lower social class, and poor support networks on parents' experiences when a premature infant is born and subsequently admitted to a special care nursery. This information would be most useful if they are supported by comparisons with concurrent qualitative data. It is also vital to develop and test the interventions that have been developed that aim to reduce parental stress. Examples include encouraging parents to take an active part in the caring giving activities of their infants and comparing outcomes with those who did not take an active part in the caregiving activities of their infants.

Chapter 11 discusses the implications of this study for clinical practice.

Chapter 11 Implications for clinical practice Page

Chapter 11

Implications for clinical practice

11. **Introduction**

The results of this study provide important information for health care professionals caring for premature infants in a special care nursery (SCN). Health care professionals working in the special care nursery often do not expect parents to be stressed because the infants are relatively well, not ill and they have been admitted for observation only or mainly because of their prematurity. It is important for the nurses, doctors and allied health staff to understand the experiences of these parents and to consider from the onset, ways of responding to the stress experiences of these parents especially in the first days and week following the unexpected early birth of their infant.

Key issues to consider are that a stressful encounter is not static event but rather a process in a state of flux. However, in order to understand an individual's coping processes and strategies, several elements have to be taken into account. These include a person's personal characteristics such as personality traits which refer to the dispositional or personality attributes that lead to a particular response at a given time (Folkman et al., 1986); their physical and emotional status that underpins the well-being of the individual at the time; and importantly the perceptions and interpretations of being adequately supported or not. The triggering event, in this scenario the birth of a premature infant, is constantly being appraised at both the primary and the secondary appraisal levels (Lazarus, 1966; Lazarus and Folkman, 1984). An understanding of each parent's coping style and strategies with their preterm infant while in the special care nursery should include the nature of the cognitive appraisal and meaning that each parent gives to the situation.

How parents cognitively appraise the birth of their preterm infants will determine ultimately their coping strategies. Coping behaviours affect the parents' perception of the nature, meaning, and power of the stressors that impinge on them and these interpretations then determine their range of responses to the range of stressors. Parents in SCN in this study have shown to use a variety of coping strategies that focus at times on problem solving and also at other times on their emotional responses to the stressful situation. Parents utilise different coping strategies at different phases of the stress experience as they struggle to cope with the stressful event of preterm birth. In the early stages, high anxiety, powerlessness and fright may be paramount so emotion-focused coping strategies can be seen to be appropriate and useful. This could appear as indecision, apparent disinterest or detachment from the present reality, or very frequent demands for information, answers, and predictions.

As well, some parents may be verbally critical, seemingly ungrateful or impolite and sharp, As the parents are likely to be emotionally aroused they are unable to think clearly, or to engage with a calm, measured approach. Subsequently, problem-focused coping could be efficacious that drives the parents to seek information about their infant's condition, to seek to discuss issues with the medical and nursing staff, and to consider the short-term and long-term consequences for them and their family. The timely provision of information from professional and lay sources will assist the parents to experience a sense of taking stock towards gaining increasing control through acquiring a greater understanding. Simultaneously, access to a supportive and caring network will provide a sounding-board through discussion and debates, recommendations for action; and a sense of being supported and not alone. These aspects will all assist in reducing high emotions to manageable levels.

Health care professionals must be attuned to individual differences of the parents as well as remain aware of the likelihood for gender differences in responses between the mothers and the fathers. Thus, health professionals should avoid making judgemental assessments of each parent's coping responses.

It is important for health care professionals (nurses, doctors, clinical psychologists, social workers) who specialised in neonatal paediatrics to have the necessary training and experience to meet the needs of these parents. Thus, part of their educational programme should consider the psychosocial aspects of neonatal paediatrics which is essential to promote an awareness and understanding of the responses and needs of these parents. As part of their experience in SCN/NICU, they should increasingly be able to recognise the needs of these parents and to be able to provide emotional support in a timely manner. It is important to health care professionals in SCN to ascertain at periodic intervals what the parents' actual perceptions of stress are, rather than making assumptions based on stereotyped beliefs of what might be stressful for the parents. It is also important for staff to recognise that parents of premature infants perceive stress from numerous sources that emanate from both within themselves through their own 'self-talk' and outside the SCN environment. Parents not only deal with a stressful situation but are also trying to manage other aspects of their lives, often including caring for other children and juggling work and family roles. Hughes and McCollum (1994) found in their study of premature infants in NICU that numerous stressors were identified. These included the NICU physical environment, trying to combine work and family roles and related responsibilities (such as finding additional, unplanned for child care).

11.1 **Interdisciplinary team**

Care for parents of premature infants in SCN should be provided by an interdisciplinary team consisting of neonatologists, nurses, and allied health personnel (e.g. social worker, psychologist/psychiatrist as needed). The neonatal nurses have the most contact with the parents and therefore have the opportunity to continuously assess how each of the parents is coping with the strange and unexpected experiences of a premature offspring. These staff should schedule in specified times to sit down with the parents and encourage them to express their individual feelings and needs. A major concern shared by these parents is related to the prematurity of the infant, the physical and the long term neuro-developmental outcomes. The neonatologists can help to reduce the parents' anxiety by providing them with clear and consistent information in plain language about their infant's progress and management goals. It is important to aim verbal communications to the parents' level of understanding at any given time. This readiness constantly ebbs and flows. As parents begin to understand and comprehend the information, their levels of anxiety will decrease as the issues become identified, as their own roles are considered and their ability to cope with the situation will increase. This can be achieved through not flooding the parents with too much information at any one time; repeating important aspects more than once; providing time that is not rushed; putting up options and requesting the parents' input into choices; engaging in whatever activities and behaviours that are possible to create some balance towards normal activities (e.g. changing a nappy, stroking the infant). Parents want direct and uncomplicated communication with health care professionals demonstrated in the recent study by Sim (2000).

An important role of the social worker is to assess the level of family functioning, and its personnel and other resources (Noble and Hamilton, 1981). The medical cost of a premature infant is expensive and parents are usually concerned with the charges associated with the infant's hospitalisation, with the costs of daily or frequent travel and telephone calls. The social worker can serve as a source of referral for parents who need financial assistance.

A mental health professional has a key role in special care nursery (O'Brien et al., 1995). Special care nursery can be a stressful environment for the uninitiated parents who often feel excluded, powerless, and in an alien world. A clinical psychologist has a role to play in assisting them to reduce their stress and facilitate effective coping strategies, identifying sources of strength that can help the parents cope with immediate problems and long term consequences. He/she can assist parents in understanding the meaning and significance of preterm birth, clarifying for parents their own responses and behaviours, facilitating effective communication between the health care professional and the parents, and providing grief counselling and guidance towards effective emotion management to the parents (O'Brien et al., 1995).

11.2 **Parents' participating in the care of their premature infants**

It has been reported that unresolved parental stress can contribute to both maladaptive parenting and a higher possibility of parent-child problems. These parental styles include over-protectiveness (Jeffcoate et al., 1979a), failure to thrive outcomes (Steele, 1987), and in extreme cases, child abuse (James and Mott, 1988). Boardman (1995) proposes that many parents are better able to cope with the stress of having a preterm infant in SCN when they take an active part in the care of their infants. These activities allow them to feel useful and to gain experience in the handling of their tiny child. The parents should be encouraged to touch, handle, hold, and the mother to breast feed their infant if they wish to do so, thus, helping them to feel involved and important. This approach involves empowering parents when they have a perception of greater personal control over their infant's care. This in turn reduces their feelings of helplessness, increases their confidence and self-esteem and reduces their anxieties to manageable levels.

The attainment of the maternal role is important because it influences continuing parenting behaviours (Koniak-Griffin, 1993). The maternal role attainment is marked by a mother's appraisal of her parenting activities, including her relationship with her infant and her satisfaction with being a parent (Mercer, 1986). The infant's interaction with her has been identified as one of the major sources of satisfaction for new mothers (Pridham, 1987).

A parent's experience of a special care baby unit (SCBU) revealed that she found the hardest part of the whole experience was having to stand by and watch while other people made all the decisions about her baby. She wanted to take responsibility and make decisions for her baby herself (Whiteley, 1996). Holditch-Davis and Miles (2000), who interviewed 31 mothers whose infants were admitted to NICU, found that loss of the parental role such as the ability to hold, feed, and bathe the baby was a major stressor because these are tasks that all mothers of newborn infants expect to perform prior to the infants' discharge. The parents should be engaged in discussion on their expectations and needs. This will increase the parent's confidence and promote positive parenting especially if a telephone contact or 'HelpLine' can be provided for questions to be answered. It is essential that the interdisciplinary staff members and parents become a united team that strives together not only to promote the survival of the preterm infant but also to lay the foundations for a well-adjusted adaptable future family of integrated parent-child relationships.

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Appendices

Appendix A

Page

Information Sheet (Parents of Preterm Infants)

The Experiences and Needs of Parents with Premature Babies in Special Care Nursery

My name is Rosalind Lau. I am a registered nurse with 16 years of experience in the neonatal intensive and special care nursery. I am undertaking a research for my doctoral study at Victoria University of Technology in the Department of Human Development, under the supervision of Professor Carol Morse, Professor of Women's Health and Professor Colin Morley.

I am seeking new parents, both mothers and fathers, with **premature babies** to participate in a study on the experiences of parents in special care nursery.

In the last few years, with the advances in technology, there has been more monitoring equipment in special care nursery which made it possible to provide care for smaller and sicker babies than before. However, little evaluation on the impact of this environmental change on the parents has been reported. This study aims to find out what are the experiences and needs of parents having premature babies born between 30-35 weeks at birth and being cared for in a special care nursery. The study is also conducted to find out how parents cope in such a situation.

As this is the first time you have a baby in special care nursery, you are invited to participate in this study. The information you provide will be used to inform nurses, doctors and social workers about the parents' experiences and needs while their babies are cared for in special care nursery. This information may be used to assist these health care professionals to provide support to parents like you having a premature baby in special care nursery.

Your involvement in this study will require you to participate in a short interview to collect demographic information and to complete questionnaires at specified times. You will also be asked to provide a small amount of saliva so that we can measure emotion-related hormones. This is easily done by placing a small dental roll under your tongue for about 5 minutes after a mouth rinse with plain water. You and your partner will be asked for the same requirements on five occasions at (1) within 24 hours after your first visit to special care nursery, (2) 1 week after your baby has been in special care nursery, (3) at the time of your baby discharge from the hospital, (4) 1 week after your baby has been home from the hospital, and (5) 4 months after your baby has been home. The measures are taken 5 times to measure the changes of your emotions over time. The interview will take no more than 10 minutes. The completion of the questionnaire will take no more than 15 minutes at Times 1 and 5 and 10 minutes at Times 2, 3 and 4. Your participation in this study is entirely voluntary and there are no risks to you or your baby.

If you are willing to participate, please sign the attached consent forms and return them to me. If you wish to withdraw from this study you may do so anytime by contacting me and it will in no way affect the care and treatment given to your baby.

Your answers will remain totally anonymous and confidential and all information will be coded. No one will have access to your information except two supervisors and myself. Your information will be stored securely at the Royal Women's Hospital.

If you have any questions about this study at any stage please contact me. Many thanks for your cooperation.

Researcher's name: Rosalind Lau
Contact telephone number: 9344 2000 page 2818

Yours sincerely,

Rosalind Lau, RN, RM, M.Ed.Studs.

Information Sheet (Parents of Term Infants)

The Experiences and Needs of Parents with Premature Babies in Special Care Nursery

My name is Rosalind Lau. I am a registered nurse with 16 years of experience in the neonatal intensive and special care nursery. I am undertaking a research for my doctoral study at Victoria University of Technology in the Department of Human Development, under the supervision of Professor Carol Morse, Professor of Women's Health and Professor Colin Morley.

I am interested in studying the experiences and needs of new parents, both mothers and fathers, with premature babies being cared for in special care nursery. To be able to carry out this study, we are also seeking parents of term babies to participate as a comparison group to find out whether there are any differences in experiences and needs between parents of term and premature babies.

As you have just given birth to a **healthy full-term baby**, you are invited to participate in this important study. By collecting information on parents' experiences of having a new baby and how they cope in different situations; this study will inform the nurses, doctors and social workers who can be more responsive to the needs of new parents.

Your involvement in this study will require you to participate in a short interview to collect demographic information and to complete questionnaires at specified times. You will also be asked to provide a small amount of saliva so that we can measure emotion-related hormones. This is easily done by placing a small dental roll under your tongue for about 5 minutes after a mouth rinse with plain water. You and your partner will be asked for the same requirements on three occasions, at (1) within 24 hours after you have given birth to your baby, (2) 1 week after your baby has been home, and (3) 4 months after your baby has been home. The measures are taken 3 times to measure the changes in your emotions over time. The interview will take no more than 10 minutes. The completion of the questionnaire will take no more than 15 minutes at Times 1 and 3 and 10 minutes at Time 2. Your participation in this study is entirely voluntary and there are no risks to you or your baby.

If you are willing to participate, please sign the attached consent forms and return them to me. If you wish to withdraw from this study you may do so anytime by contacting me and it will in no way affect the care and treatment given to your baby.

Your answers will remain totally anonymous and confidential and all information will be coded. No one will have access to your information except two supervisors and myself. Your information will be stored securely at the Royal Women Hospital.

If you have any questions about this study at any stage please contact me. Many thanks for your cooperation.

Researcher's name: Rosalind Lau
Contact telephone number: 9344 2000 page 2818

Yours sincerely,

Rosalind Lau, RN, RM, M.Ed.Studs.

Demographic Questionnaire (Mother of Premature Baby)

This is a study about the experiences of parents with premature babies in the special care nursery.
I would like to ask you a few general questions about yourself and then ask you to complete a few short questionnaires.
Are you ready to begin?

1 What is your age? ________

2 a) What is your present marital status?
Married
Defacto relationship. **If defacto relationship, is your partner the biological father of the baby?** Yes/No
b) How long have you been in this present relationship? ________

3 What is your ethnic background?
Australian
British
European
Asian
Other

4 Which of the following people live with you?
Husband
Children
Parents and/or Inlaws
Other adults

5 At what age did you leave school?
14 years or younger
15 or 16 years
17 years
18 years or older

6 Would you please tell me the highest level of education you've reached?
Primary School
Secondary School
Trade/Apprenticeship
Certificate/Diploma
Bachelor Degree/Higher

7 What was your usual occupation?
Professional
Owner/Executive
Owner of Small Business
Sales
Semi-Professional
Skilled Tradesperson
Unskilled
Farm Owner
Home Duties
Other

8 a) Are you usually in paid employment? Yes/No

If Yes, **is that full-time of 35 hours or more a week or part-time?**

Yes, Full-time

No, Part-time

b) When have you plan to go back to work? _______

9 a) Is this your first baby? Yes/No

If No, how many babies have you given birth to? _______

b) How many children are you raising? _______

c) Did you have any problems with this pregnancy? Yes/No

If Yes, please describe

____

____

____

10 a) Have you been given any information about premature baby? Yes/No

If Yes, where did you get the information from?

____

____

____

b) What was the information about?

____

____

____

c) Are you satisfied with the information given? Yes/No

If No, Why?

____

____

____

11 a) Do you know why your baby is admitted to SCN? Yes/No

b) Has anybody explained your baby's condition to you? Yes/No

If Yes, who has explained it to you?

____

____

____

c) What do you understand from the explanation?

____

____

____

Thank you for answering these questions

Demographic Questionnaire (Father of Premature Baby)

This is a study about the experiences of parents with premature babies in the special care nursery.

I would like to ask you a few general questions about yourself and then ask you to complete a few short questionnaires.

Are you ready to begin?

1 **What is your age?** ______

2 a) **What is your present marital status?**

Married

Defacto relationship. **If defacto relationship, are you the biological father of the baby?** Yes/No

b) **How long have you been in this present relationship?** ______

3 **What is your ethnic background?**

Australian

British

European

Asian

Other

4 **Which of the following people live with you?**

Wife

Children

Parents and/or Inlaws

Other adults

5 **At what age did you leave school?**

14 years or younger

15 or 16 years

17 years

18 years or older

6 **Would you please tell me the highest level of education you've reached?**

Primary School

Secondary School

Trade/Apprenticeship

Certificate/Diploma

Bachelor Degree/Higher

7 **Are you in paid employment?** Yes/No

If Yes, **is that full-time of 35 hours or more a week, or part-time?**

Yes, Full-time

No, Part-time

8 If not employed ask:

Are you now looking for a paid job? Yes/No

Looking for Full-time? Yes/No

9 **If working, what is your current occupation?** Yes/No

Professional

Owner/Executive

Owner of Small Business
Sales
Semi-Professional
Skilled Tradesperson
Unskilled
Farm Owner
Home Duties
Other

10 Is this your first baby? Yes/No
If No, how many children are you raising? ______

11Is this your first premature baby? Yes/No

12 a)Have you been given any information about premature baby? Yes/No
If Yes, where did you get the information from?

____

____

b) What was the information about?

____

____

____

c) Are you satisfied with the information given? Yes/No
If No, Why?

____

____

____

13 a)Do you know why your baby is admitted to SCN? Yes/No
b)Has anybody explained your baby's condition to you? Yes/No
If Yes, who has explained it to you?

____

____

c)What do you understand from the explanation?

____

____

____

14. Do you smoke? Yes/No
If no, go to question 15
If you smoke, have you increased the number of cigarettes/day? Yes/No
If yes, how many cigarettes/day ________

15. Do you drink? Yes/No
If you drink, have you increased your alcohol intake? Yes/No**If yes, by how many glasses/week?** ________

Thank you for answering these questions

Demographic Questionnaire (Mother of Term Baby)

This is a study about the experiences of parents with premature babies in the special care nursery.
To do the study, I need a comparison group. As you have just given birth to a healthy term baby, I would like to ask a few general questions about yourself and then ask you to complete a few short questionnaires.
Are you ready to begin?

1 What is your age? ______

2 a) What is your marital status?
Married
Defacto relationship. **If defacto relationship, is your partner the Biological father of the baby?** Yes/No
b) How long have you been in this present relationship? ______

3 What is your ethnic background?
Australian
British
European
Asian
Other

4 Which of the following people live with you?
Husband
Children
Parents and/or Inlaw
Other adults

5 At what age did you leave school?
14 years or younger
15 or 16 years
17 years
18 years or older

6 Would you please tell me the highest level of education you've reached?
Primary School
Secondary School
Trade/Apprenticeship
Certificate/Diploma
Bachelor Degree/Higher

7 What was your usual occupation?
Professional
Owner/Executive
Owner of Small Business
Sales
Semi-Professional
Skilled Tradesperson
Unskilled
Farm Owner

Home Duties
Other

8a) Are you usually in paid employment? Yes/No
If Yes, **is that full-time of 35 hours or more a week or part-time?**
Yes, Full-time
No, Part-time
b) When have you plan to go back to work? ______

9a) Is this your first baby? Yes/No
If No, how many babies have you given birth to? ______
b) How many children are you raising? ______

Thank you for answering these questions

Demographic Questionnaire (Father of Term Baby)

This is a study about the experiences of parents with premature babies in the special care nursery.
To do the study, I need a comparison group. As you have a new born healthy term baby, I would like to ask you a few general questions about yourself and then ask you to complete a few short questionnaires.
Are you ready to begin?

1 What is your age? _____

2 a) What is your present marital status?
Married
Defacto relationship. **If defacto relationship, are you the biological father of the baby?** Yes/No
b) How long have you been in this present relationship? _____

3 What is the ethnic background?
Australian
British
European
Asian
Other

4 Which of the following people live with you?
Wife
Children
Parents and/or Inlaw
Other adults

5 At what age did you leave school?
14 years or younger
15 or 16 years
17 years
18 years or older

6 Would you please tell me the highest level of education you've reached?
Primary School
Secondary School
Trade/Apprenticeship
Certificate/Diploma
Bachelor Degree/Higher

7 Are you in paid employment? Yes/No
If Yes, **is that full-time of 35 hours or more a week, or part-time?**
Yes, Full-time
No, Part-time

8 If not employed ask:
Are you now looking for a paid job? Yes/No
Looking for Full-Time? Yes/No

9 If working, what is your current occupation?
Professional
Owner/Executive
Owner of Small Business
Sales
Semi-Professional
Skilled Tradesperson
Unskilled
Farm Owner
Home Duties
Other

10 Is this your first baby? Yes/No
If No, how many children are you raising? ______

11 Do you smoke? Yes/No
If no, go to question 12
If you smoke, have you increased the number of cigarettes/day? Yes/No
If yes, how many cigarettes/day _______

12 Do you drink? Yes/No
If you drink, have you increased your alcohol intake? Yes/No
If yes, by how many glasses/week?_______

Thank you for answering these questions

Direction: A number of statements that people have used to describe themselves are given below: Read each statement and then circle the appropriate number on the answer sheet to indicate how you feel right now. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

		NOT AT ALL	SOME-WHAT	MODER-ATELY	VERY MUCH
Example:	I feel angry	1	2	3	4

	NOT AT ALL	SOME-WHAT	MODER-ATELY	VERY MUCH
1. I feel calm	1	2	3	4
2. I am furious	1	2	3	4
3. I am tense	1	2	3	4
4. I feel like banging on the table	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel angry	1	2	3	4
7. I am presently worrying over possible misfortune	1	2	3	4
8. I feel like yelling at somebody	1	2	3	4
9. I feel nervous	1	2	3	4
10. I feel like breaking things	1	2	3	4
11. I am jittery	1	2	3	4
12. I am mad	1	2	3	4
13. I am relaxed	1	2	3	4
14. I feel irritated	1	2	3	4
15. I am worried	1	2	3	4
16. I feel like hitting someone	1	2	3	4
17. I feel steady	1	2	3	4
18. I am burned up	1	2	3	4
19. I feel frightened	1	2	3	4
20. I feel like swearing	1	2	3	4

Self-Report Questionnaire – II

Direction: A number of statements that people have used to describe themselves are given below. Read each statement and then circle the appropriate number on the answer sheet to indicate how you generally feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

		ALMOST NEVER	SOME-TIMES	OFTEN	ALMOST ALWAYS
Example:	I feel secure	1	2	3	4

	ALMOST ALWAYS	SOME-TIMES	OFTEN	ALMOST ALWAYS
1. I am a steady person				
2. I am quick tempered	1	2	3	4
3. I feel satisfied with myself	1	2	3	4
4. I have a fiery temper	1	2	3	4
5. I feel nervous and restless	1	2	3	4
6. I am a hotheaded person	1	2	3	4
7. I wish I could be as happy as others seem to be	1	2	3	4
8. I get angry when I'm slowed down by others mistakes	1	2	3	4
9. I feel like a failure	1	2	3	4
10. I feel annoyed when I am not given recognition for doing good work	1	2	3	4
11. I get in a state of tension or turmoil as I think over my recent concerns and interests	1	2	3	4
12. I fly off the handle	1	2	3	4
13. I feel secure	1	2	3	4
14. When I get mad, I say nasty things	1	2	3	4
15. I lack self-confidence	1	2	3	4
16. I makes me furious when I am criticized in front of others	1	2	3	4
17. I feel inadequate	1	2	3	4
18. When I get frustrated, I feel like hitting someone	1	2	3	4
19. I worry too much over something that really does not matter	1	2	3	4
20. I feel infuriated when I do a good job and get a poor evaluation	1	2	3	4

Feeling Checklist

Instructions:

The adjectives shown below describe different feelings and moods. Please use this list to describe your feelings at this moment in time.

If the adjective definitely describes your feelings circle the: ++ + ? -

If the adjective more or less describes your feelings circle the: ++ + ? -

If you do not understand the adjective, or you cannot decide whether it describes how you feel circle the: ++ + ? -

If the adjective does not describe the way you feel circle the: ++ + ? -

Your first reactions will be the most reliable, therefore do not spend too long thinking about each adjective. Please be as honest and accurate as possible.

Example: Restful ++ + ? -

Tense	++	+	?	-	Tired	++	+	?	-
Relaxed	++	+	?	-	Idle	++	+	?	-
Restful	++	+	?	-	Up tight	++	+	?	-
Active	++	+	?	-	Alert	++	+	?	-
Apprehensive	++	+	?	-	Lively	++	+	?	-
Worried	++	+	?	-	Cheerful	++	+	?	-
Energetic	++	+	?	-	Contented	++	+	?	-
Drowsy	++	+	?	-	Jittery	++	+	?	-
Bothered	++	+	?	-	Sluggish	++	+	?	-
Uneasy	++	+	?	-	Pleasant	++	+	?	-
Drowsy	++	+	?	-	Sleepy	++	+	?	-
Nervous	++	+	?	-	Comfortable	++	+	?	-
Distressed	++	+	?	-	Calm	++	+	?	-
Vigorous	++	+	?	-	Stimulated	++	+	?	-
Peaceful	++	+	?	-	Activated	++	+	?	-

On the questionnaire, circle the single number that best expressed how stressful each experience has been for you. The numbers indicate the following levels of stress:

1= Not at all stressfulthe experience did not cause you to feel upset, tense or anxious
2= A little stressful
3= Moderately stressful
4= Very stressful
5= Extremely stressfulthe experience upset you and cause a lot of anxiety or tension

We are interested in knowing about your view of how stressful these SIGHTS AND SOUNDS are for you. Circle the number that best represents your level of stress. If you did not see or hear the item, circle the NA meaning "Not applicable".

1. The presence of monitors and equipment	NA	1	2	3	4	5
2. The constant noises of monitors and equipment	NA	1	2	3	4	5
3. The sudden noises of monitor alarms	NA	1	2	3	4	5
4. The presence of other sick babies in the room	NA	1	2	3	4	5
5. The large number of people working in the nursery	NA	1	2	3	4	5

Below is the list of items that might describe the way your baby LOOKS AND BEHAVES while you are visiting as well as some of the TREATMENTS that you have seen done to the baby. Not all babies have these experiences or look this way, so circle the NA, if you have not experienced or seen the listed item. If the item reflects something that you have experienced, then indicate how much the experience was stressful or upsetting to you by circling the appropriate number.

1. Tubes and equipment on or near my baby	NA	1	2	3	4	5
2. Bruises, cuts or incisions on my baby	NA	1	2	3	4	5
3. The unusual colour of my baby (for example looking pale or yellow (jaundiced))	NA	1	2	3	4	
4. My baby's unusual or abnormal breathing patterns	NA	1	2	3	4	5
5. Seeing my baby suddenly change colour (for example, becoming pale or blue	NA	1	2	3	4	5
6. Seeing my baby stop breathing	NA	1	2	3	4	5
7. The small size of my baby	NA	1	2	3	4	5
8. The wrinkled appearance of my baby	NA	1	2	3	4	5
9. Seeing needles and tubes put in my baby	NA	1	2	3	4	5
10.My baby being fed by an intravenous line or tube	NA	1	2	3	4	5
11.When my baby seemed to be in pain	NA	1	2	3	4	5
12.My baby crying for long periods	NA	1	2	3	4	5
13.When my baby looked afraid	NA	1	2	3	4	5
14.When my baby looked sad	NA	1	2	3	4	5
15.The limp and weak appearance of my baby	NA	1	2	3	4	5
16.Jerky or restless movements of my baby	NA	1	2	3	4	5

Please turn over

The last area we want to ask you about is how you feel about your own RELATIONSHIP with the baby and your parental role. If you have experienced the following situations or feelings, indicate how stressful you have been by them by circling the appropriate the number. Again, circle NA if you did not experience the item.

1. Being separated from my baby	NA	1	2	3	4	5
2. Not feeding my baby myself	NA	1	2	3	4	5
3. Not being able to care for my baby myself (for example, changing nappy, bathing)	NA	1	2	3	4	5
4. Not being able to hold my baby when I want	NA	1	2	3	4	5
5. Sometimes forgetting what my baby looks like	NA	1	2	3	4	5
6. Not being able to share my baby with other family members	NA	1	2	3	4	5
7. Feeling helpless and unable to protect my baby from pain and painful procedures	NA	1	2	3	4	5
8. Being afraid of touching or holding my baby	NA	1	2	3	4	5
9. Feeling staff is closer to my baby than I am	NA	1	2	3	4	5
10. Feeling helpless about how to help my baby during this time	NA	1	2	3	4	5

We are also interested in whether you experienced any stress related to STAFF BEHAVIOURS and COMMUNICATION, Again, if you experienced the item indicate how stressful it was by circling the appropriate number. If you did not experience the item, circle the NA meaning "Not applicable." Remember, your answers are confidential and will not be shared or discussed with any staff member.

1. Staff explaining things too fast	NA	1	2	3	4	5
2. Staff using words I don't understand	NA	1	2	3	4	5
3. Telling me different (conflicting) things about my baby's condition	NA	1	2	3	4	5
4. Not telling me enough about tests and treatments being done to my baby	NA	1	2	3	4	5
5. Not talking to me enough	NA	1	2	3	4	5
6. Too many different people (doctors, nurses, others) talking to me	NA	1	2	3	4	5
7. Difficulty in getting information or help when I visit or telephone the nursery	NA	1	2	3	4	5
8. Staff looking worried about my baby						
9. Staff acting as if they do not want parents around	NA	1	2	3	4	5
10. Staff acting as if they do not understand baby's behaviour or special needs	NA	1	2	3	4	5

Using the same rating scale, indicate how stressful in general, the experience of having your baby hospitalised.

1 2 3 4 5

Ways of Coping Checklist

Instructions: Below are a number of statements about the ways people attempt to deal with a particular event in their lives.
First, think of the most stressful event you have experienced during the last two weeks. Briefly describe below:

Next, tick on the checklist below those actions/decisions you took in relation to the episode. There are no right or wrong answers simply a request for you to indicate how you have been dealing with one of your life experiences in the last two weeks.

1. I bargained or compromised to get something positive from the situation. -----------
2. Talked to someone to find out more about the situation. -----------
3. I blamed myself. -----------
4. I hoped a miracle would happen. -----------
5. I carried on as if nothing had happened. -----------
6. Concentrated on something good that could come out of the whole thing. -----------
7. Accepted sympathy and understanding from someone. -----------
8. I criticised and lectured myself. -----------
9. Wished I were a stronger person-more optimistic and forceful. -----------
10. I felt bad that I couldn't avoid the problem. -----------
11. I tried not to burn my bridges behind me(throw away my chances). -----------
12. I took professional help and did what they recommended. -----------
13. I realised that I brought the problem on myself. -----------
14. Wished that I could change what had happened. -----------
15. Kept my feelings to myself. -----------
16. I changed and grew as a person in a good way. -----------
17. I talked to someone who could do something about the problem. -----------
18. Wished that I could change the way I felt. -----------
19. Slept more than usual. -----------
20. Accepted the next best thing to what I really wanted. -----------
21. Asked someone I respected for advice and followed it. -----------
22. Day dreamed or imagined a better time or place than the one I was in. ---------
23. I was angry at the people or things that caused the problem. -----------
24. I came out of the experience better than when I went in. -----------
25. I talked to someone about how I was feeling. -----------
26. I tried not to act too hastily. -----------
27. I thought about fantastic or unreal things (eg. finding a million dollars, perfect revenge). -----------
28. I changed something so things would turn out alright. -----------
29. I wished the problem would go away or be finished. -----------

Please turn over

30.I just took one step at a time. -----------
31.I tried to forget the whole thing. -----------
32.I knew what had to be done, so I doubled my efforts. -----------
33.I tried to feel better by eating, drinking, smoking or taking medications. ------
34.I thought of a couple of different solutions. -----------
35.I avoid being with others in general. -----------
36.I accepted my strong feelings but didn't let them interfere with other things too much. -----------
37.I kept others from knowing how bad things really were for me. -----------
38. I worked at changing myself so I could deal with the situation better. ---------
39.I refused to believe it had happened. -----------
40.I stood my ground and fought for what I wanted. -----------
41. I went on as if nothing had happened. -----------
42.I had fantasies or wishes about how things might turn out. -----------

Finally, please indicate one of the four statements below best describes the situation you have just completed. Please circle the number of the one that best describes the situation.

In general, is this situation one that:

1. you really could change or do something about?
2. must be accepted or adapted to?
3. you needed to know more before you could act?
4. you had to hold yourself back from doing what you really wanted to?

Social Support Questionnaire

Instructions: The following questions ask about people in your environment who provide you with help or support. Each question has two parts. For the first part, list all the people you know whom you can count on for help or support in the manner described. List their relationship to you. Do not list more than one person next to each other of the number beneath the question.

For the second part, circle how satisfied you are with the overall support you have. If you have no support for a question, check the words "No one," but still rate your level of satisfaction. Do not list more than nine persons per question.

Please answer all questions as best you can. All your responses will be kept confidential.

1aWhom can you really count on to distract you from your worries when you feel under stress?

No one	(1)	(4)	(7)
	(2)	(5)	(8)
	(3)	(6)	(9)

b How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

2a Whom can you really count on to help you feel more relaxed when you are under pressure or tense?

No one	(1)	(4)	(7)
	(2)	(5)	(8)
	(3)	(6)	(9)

b How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

3a Who accepts you totally, including both your worst and your best points?

No one	(1)	(4)	(7)
	(2)	(5)	(8)
	(3)	(6)	(9)

b How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

4a Whom can you really count on to care about you, regardless of what is happening to you?

No one	(1)	(4)	(7)
	(2)	(5)	(8)
	(3)	(6)	(9)

b How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

Please turn over

5a Whom can you really count on to help you feel better when you are feeling generally down-in-the-dumps?

No one	(1)	(4)	(7)
	(2)	(5)	(8)
	(3)	(6)	(9)

b How satisfied?

6-very satisfied	5-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

6a Whom can you count on to console you when you are very upset?

No one	(1)	(4)	(7)
	(2)	(5)	(8)
	(3)	(6)	(9)

b How satisfied?

6-very satisfied	-fairly satisfied	4-a little satisfied	3-a little dissatisfied	2-fairly dissatisfied	1-very dissatisfied

Marital/Partner Relationship

The dots on the following line represents different degrees of happiness in your relationship. The middle point, "happy", represents the degree of happiness of most relationships. Please circle the dot which best describes the degree of happiness, all things considered, of your relationship.

1	2	3	4	5	6	7
•	•	•	•	•	•	•
Extremely unhappy	Fairly unhappy	A little unhappy	Happy	Very happy	Extremely happy	Perfect

Instructions: This is a questionnaire. On the questionnaire are groups of statements.
Please read the entire group of statements in each category. Then pick out the one statement in that group which best describes that way you feel today, that is, **right now**. Circle the number beside the statement you have chosen. If several statements in the group seem to apply equally well, circle each one.

Be sure to read all statements in each group before making your choice

A.
3 I am so sad or unhappy that I can't stand it.
2 I am blue or sad all the time and I can't snap out of it.
1 I feel sad or blue
0 I do not feel sad.

B.
3 I feel that the future is hopeless and that things cannot improve.
2 I feel I have nothing to look forward to.
1 I feel discouraged about the future.
0 I am not particularly pessimistic or discouraged about the future.

C.
3 I feel I am a complete failure as a person (parent, husband, wife).
2 As I look back on my life, all I can see is a lot of failures.
1 I feel I have more than the average person.
0 I do not feel like a failure.

D.
3 I am dissatisfied with everything.
2 I don't get any satisfaction out of anything anymore.
1 I don't enjoy things the way I used to.
0 I am not particularly dissatisfied.

E.
3 I feel as though I am very bad or worthless.
2 I feel quite guilty.
1 I feel bad or unworthy a good part of the time.
0 I don't feel particularly guilty.

F.
3 I hate myself.
2 I am disgusted with myself.
1 I am disappointed in myself
0 I don't feel disappointed in myself

G.
3 Would kill myself if I had the chance.
2 I have definite plans about committing suicide.
1 I feel I would be better off dead.
0 I don't have any thoughts of harming myself.

Please turn over

H.
3 I have lost all my interest in other people and don't care about them at all.
2 I have lost most of my interest in other people and have little feeling for them.
1 I am less interested in other people than I used to be.
0 I have not loss interest in other people.

I.
3 I can't make any decisions at all any more.
2 I have great difficulty in making decisions.
1 I try to put off making decisions.
0 I make decisions as well as ever.

J.
3 I feel that I am ugly or repulsive-looking.
2 I feel that there are permanent changes in my appearance and they make me look unattractive.
1 I am worried that I am looking old and unattractive.
0 I don't feel that I look any worse than I used to.

K.
3 I can't do any work at all.
2 I have to push myself very hard to do anything.
1 It takes extra effort to get started at doing something.
0 I can work about as well as before.

L.
3 I get too tired to do anything.
2 I get tired from doing anything.
1 I get tired more easily than I used to.
0 I don't get any more tired than usual.

M.
3 I have no appetite at all anymore.
2 My appetite is much worse now.
1 My appetite is not as it good as it used to be.
0 My appetite is no worse than usual.

.

Appendix B

<u>Procedure for cortisol assay</u>

Reconstitution of standards

Reconstitute the standards by adding 500µL of distilled water to each vial. Cap and mix well gentle swirling to avoid foaming. Allow to stand for 30 minutes before use.

Application

<u>Procedure for salivary cortisol</u>

Since the concentration of cortisol in saliva is very low, the method for serum and urine samples cannot be used directly. Instead the following procedure should be adopted. This application is not routinely tested in the Quality assurance of orion Diagnostica.

1. Using the 2000 nmol/L standard, prepare the following dilutions in buffer (0.1 M Tris-HCl. PH 7.4, 0.2% BSA): 0, 1.0, 2.5, 10.0, 25, 50, 100 nmol/L.
2. Label coated tubes in duplicate for standards and patient samples. Set up normal, uncoated test tubes for total.
3. Pipette 150µL of standards and patient samples into appropriate tubes. Total tubes remain empty at this stage.
4. Add 500µL of cortisol tracer (red) to all tubes.
5. Mix all tubes on a vortex mixer.
6. Cover the tubes with paraffin film and incubate for 30 minutes in a 37^0C water bath.
7. Decant and tap the head of each tube except the totals firmly against absorbent paper.
8. Wash once with 1ml of distilled water, shaking the rack by hand. Decant the tubes and tap firmly against absorbent paper, leave the tubes standing upside down for down for at least 5 minutes.
9. Count each tube using a gamma counter for at least 1 minute or until 10,000 counts per tube have accumulated.

Procedure for tribulin assay

The Tribulin inhibitory activities were determined using the procedure described below:

Liver Homogenate Preparation

Obtain one 200g male rat, kill by decapitation and remove liver rapidly to an ice cold petri dish. Remove any connective and vascular tissue and then coarsely chop the liver with a pair of scissors. Divide the chopped liver into four parts and place into centrifuge tubes wash with @15-20ml of ice cold 0.1M $NaPO_4$ buffer. Homogenise liver using the polytron homogeniser for 15 seconds set at 75%, balance the tubes to 0.01g place in the high speed centrifuge and spin at 20 000*g for ten minutes. Decant supernatant and resuspend the pellet in 15-20ml of cold buffer balance the tubes again and respin at 20 000*g for a further 10 minutes. Pour off the supernatant and resuspend each pellett in 1.0ml of bufer and combine these suspensions. Make this suspension up to 20ml (by addition of @16-17ml) with buffer, aliquot into ten five ml plain capped tubes and freeze. Frozen homogynates should not be kept for more than one month, and should not be thawed and refrozen. Take a 100ul aliquot of this preparation and perform a protein assay on it.

Assay Procedure

In an extraction tube put 2.0ml of urine that has been dilute a concentration of 300ug Creatinine/ml and acidify to pH 1 by addition of 1000ul of 4N HCl, also add a couple of drops of iso-amyl alcohol to each sample. Add 2.0ml of Ethyl Acetate, gently vortex. Remove Ethyl Acetate to a separate tube and dry under N_2, add a further two ml of Ethyl Acetate to each extraction tube and again GENTLY vortex, remove Ethyl Acetate to the tubes used previously and dry to dryness under N_2, resolute the dried matter in 2.0ml of incubation buffer. From the freezer obtain 2.0ml frozen substrate and 2.0ml liver homogenate suspension, these should be diluted with buffer to give a final concentrate of exactly 100uM substrate and approximately 2mg protein/ml.

In a small test tube rack set up as many small glass as you require, 6 for nonenzymic conversion, 6 for total enzymic conversion, and 6 for each tribulin concentration to be determined. To the first 6 tubes add 100ul of 4N HCl, to the second set of 6 tubes add 50ul of buffer, and to the remaining tubes add 50ul of tribulin in buffer. Add to all tubes 100ul of substrate, place in a shaking water bath set at 30C and add 50ul of homogenate every 5 seconds to commence the reaction. Reaction is terminated after 10 minutes by addition of 50ul of 4N HCl.

To each tube of 500ul of n-ButlyAcetate, vortex and stand aside, remove 200ul of the butylacetate to scintilation vial, add 10ml scintilant and count.

Appendix C

Publications arising from this study that appeared in referred journals

1. Experiences of parents with premature infants hospitalised in neonatal intensive care units: A literature review.
   Journal of Neonatal Nursing, 1998;(4)6:23-29

2. Parents' coping in the neonatal intensive care unit: A theoretical framework.
   Journal of Psychosomatic Obstetrics & Gynecology, 2001;22:41-47